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# ESSENTIALS OF GYNECOLOGY

# ANATOMY

The nurse who wishes to get the most out of her work and render the best service to the patient must have a thorough understanding of at least the fundamentals of human anatomy. This is particularly so in gynecological nursing. To carry out properly even such everyday procedures as bladder catheterizations, perineal irrigations, and vaginal douches, demands that the attendant have considerable knowledge of the external genitalia. The nurse who is familiar with the internal reproductive organs can better understand gynecological operations and thereby be of greater help to the surgeon in the operating room. Moreover, during the patient's convalescence such a person will be able to carry out more intelligently those measures which help towards decreasing the incidence of postoperative complications.

In gynecology we are concerned primarily with the pelvic viscera, the muscles and fascia holding the various organs in place, and the external genitalia. The structure of the bony pelvis and the exact measurements of the different diameters of the pelvis are of greater interest to the obstetrician than to the gynecologist, but even the latter must be thoroughly familiar with the bony pelvis if he is to understand the position and attachments of both the internal and external genitalia. The same might

be said to be true for the nurse taking care of gynecological patients.

The **bony pelvis** is that part of the skeleton through which the body weight is transmitted from the spinal column to the thigh bones or femora. It has the shape of a ring, and four bones come together to form this ring, namely, the innominate bones, the sacrum, and the coccyx. The female pelvis has a different shape than the male. It is roomier in order that the pelvic canal may be of such dimensions that during labor the fetus can pass through it. The four bones making up the pelvis will be considered separately.

Each of the *two innominate bones* consists of three parts, ilium, ischium, and pubis. In embryo and early life the divisions are entirely separated but later become fused. Their union at the hip joint forms the acetabulum or hollow into which the head of the femur inserts. The ilium is the upper exposed portion of the bone forming the so-called iliac crest. The ischium is the lower portion of the innominate bone, and the ischial tuberosities are the parts of the skeleton on which the body rests in a sitting position. The union of the two pubic bones forms the anterior part of the pelvis and the anterior surface of the osseus ring. This point of union is known as the symphysis pubis.

The *sacrum* is usually looked on as one bone but is really formed by the fusion of five bones called the sacral vertebrae. The sacrum is wedged between the two innominate bones and held there by strong ligaments, thus forming the sacroiliac joints, derangements of which often cause backache.

The *coccyx* or tail bone forms the lowest part of the back of the pelvis and also the terminal portion of the spinal column. It is joined to the sacrum by the sacrococcygeal joint. Four vertebrae, usually completely fused together, form the coccyx. To the gynecologist this small
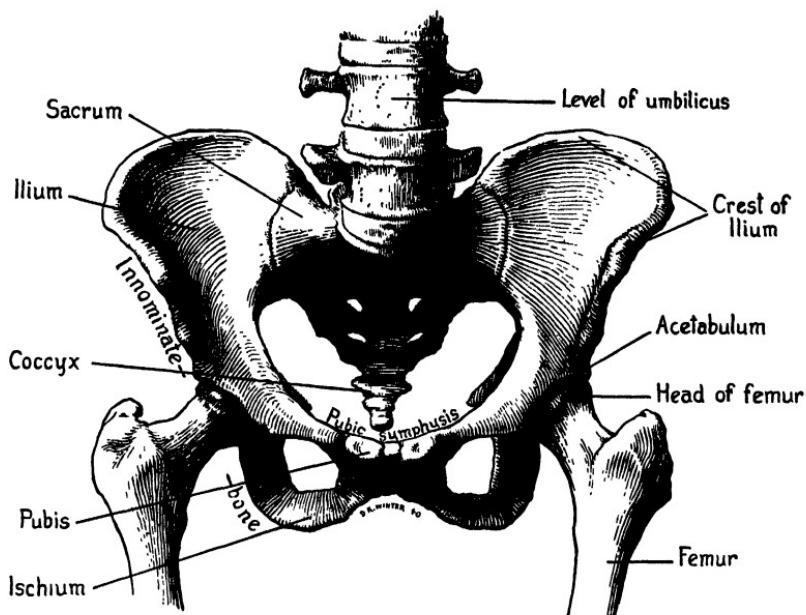
Fig. 1.—The bony pelvis. It has the shape of a ring and is made up of four bones, the two innominate bones, the sacrum, and the coccyx. Each innominate bone consist of three parts, the ilium, ischium, and pubis.

bone is of considerable interest as "pain at the end of my spine" is a complaint which he not infrequently hears from his patients. Coccygodynia is the medical term for this symptom.

When the bony pelvis is considered as a whole it is conveniently divided by the *linea terminalis* into an upper portion, or false pelvis, lying above the pelvic brim and a lower portion, or true pelvis, below this brim. This division is of interest primarily when the pelvis is being studied from the point of view of childbearing. In discussing the female pelvis one must remember that the features that distinguish it from the same structure in the male are not apparent until puberty is reached. The broadening of the pelvis is one of the most important of the changes that take place at this time.

The female organs of reproduction may be divided into the external and internal genitalia. With each group, because of their close anatomical or physiological relation, will be considered certain other structures. For instance, with the external genitalia the urinary meatus and anus should be studied, while the urethra, bladder, ureters, rectum, and sometimes the kidneys lie so close to the internal genitals as to demand attention when a pelvic laparotomy is performed. Moreover, the breasts, because of their marked changes with pregnancy, deserve consideration in any book on the diseases of women.

### THE EXTERNAL GENITAL ORGANS

The *external genitalia* are sometimes collectively called the vulva or pudendum. The separate parts of the vulva will next be considered in some detail.

The *mons veneris* is the name given to a special pad of fat which covers the anterior portion of the pubic bones and forms the upper border of the vulva. After puberty the overlying skin is covered with hair.

The *labia majora* are the folds that form the lateral borders of the vulva. Anteriorly they connect with the mons veneris and posteriorly with the perineum. The labia majora of women in the menstruating age contain sufficient subcutaneous fat to make them stand out prominently, but in the aged, because of the disappearance of fat, these labial folds sometimes shrink to such an extent as to make them almost entirely disappear. The outer surface of each labium is covered after puberty with hair but the inner surface remains smooth, moist, and hairless. The lateral labial skin is of a coarser texture than is that of the medial surface.

The *labia minora* are the small folds that lie beneath the larger ones just described. In virgins they are often entirely hidden by the labia majora. They are folds of tissue containing no fat. They are not covered with hair.

Mons veneris

Clitoris

Labia minora

Ext. urethra

Skene's ducts

Labia majora

Vaginal orifice

Hymen

Bartholin glands

Perineum

Anus

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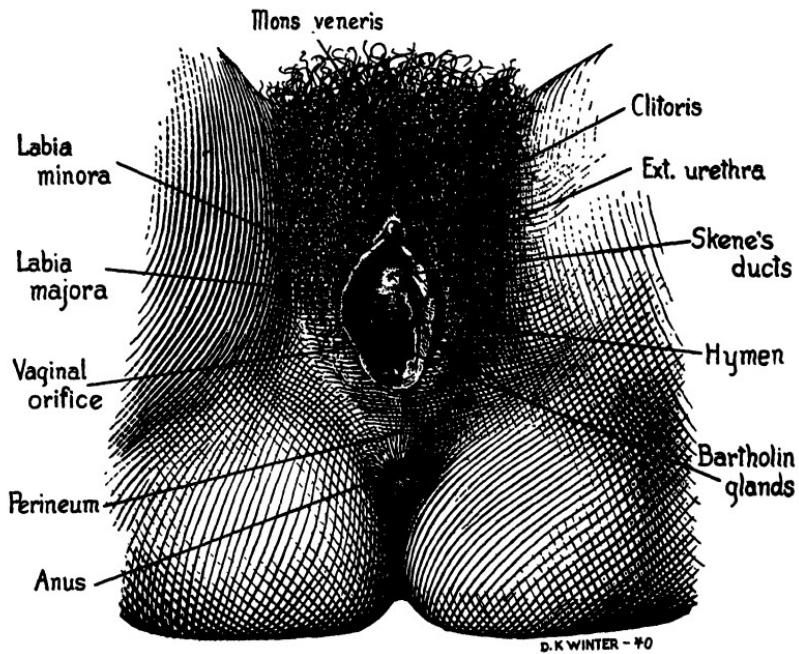
FIG. 2.—The external genitalia.

They unite anteriorly in front of the clitoris, forming a point of attachment for that organ. Posteriorly they blend into the medial surfaces of the labia majora.

The *clitoris* is a little structure that lies between the folds of the labia minora. It is important for the nurse taking care of gynecological patients to know the exact location of the clitoris as this little organ is quite sensitive to touch and if, in catheterizing a patient, the attendant touches the clitoris with the catheter she will cause unnecessary discomfort.

While the *external urethra* is not actually a part of the reproductory system it deserves special consideration because of its anatomical position. It lies just a little below the clitoris, situated usually upon the summit of a slight papilla-like elevation. On either side of the orifice two pin-point openings can usually be seen. These are the

para-urethral or Skene's ducts which are of considerable clinical importance as they are apt to become involved by the gonococcus, and sometimes the infection remains in them when it has died out in the other tissues.

Directly posterior to the external urethra, and best seen when the labia are separated, is the vaginal orifice which in the virgin is partially closed by the hymen, a thin fold of mucous membrane covered on both sides by epithelium and perforated in the center. The hymenal opening is usually circular or crescentic in shape. With sexual relations the hymen is stretched and torn. After childbirth usually all that remains of it are a few fleshy projections at the orifice of the vagina. Conclusions as to the virginity of a patient must not be hastily drawn from an examination of the hymen as this structure may be stretched or ruptured in other ways than through coitus. Occasionally one sees a child who has a hymen with no opening; in other words it is imperforate. Unless corrected this may cause serious trouble at puberty, due to menstrual blood being retained in the vagina.

On each side of the vaginal orifice are the vulvovaginal or *Bartholin glands* whose function is to secrete mucus for the lubrication of the vagina and vulva. Each gland is normally about the size of a pea but when invaded by the gonococcus may reach considerable size. The ducts of the glands open near the hymen.

The *perineal body* or *perineum* is the name given to the mass of tissue which separates the vagina from the anus. In the virgin it is over an inch thick but in women who have borne children it sometimes becomes quite thin. It is made up of skin, connective tissue (partially in the form of layers of fascia), muscles, blood vessels, and nerves. The most important structure in the perineum are the levator ani and the sphincter ani muscles. These are the two muscles which are most apt to be torn in difficult and instrumental labors.

The *vagina* connects the external with the internal organs of reproduction. Unless it is distended the vagina is a closed muscular tube, lined with mucosa, and kept moist by the constant secretion of mucus. There should, however, be no discharge or leucorrhea in a perfectly healthy woman. It is important for a nurse to remember, when inserting a vaginal douche nozzle, that the direction of the vagina is from below upward and backward toward the back of the patient. The lower end of the vagina terminates at the vulva. The cervical or lower portion of the uterus dips down into the vagina and is attached to its upper end. The spaces between the cervix and the vaginal walls are called the fornices. There are four of these, the anterior, the posterior, and the two lateral. These spaces come into such close relationship with the fallopian tubes, ovaries, ureters, and the lowest part of the peritoneal cavity that in describing the results of a pelvic examination a gynecologist will often speak of the findings in the different fornices. For instance, a pelvic abscess starting in the fallopian tubes may extend downward into the bottom of the peritoneal cavity, known as the pouch or cul-de-sac of Douglas, and finally cause bulging of the posterior vaginal wall behind the cervix. Such an abscess may be diagnosed by the tenderness and induration discovered by palpating behind the cervix in the posterior fornix. Incidentally, the cul-de-sac of Douglas, which is part of the peritoneal cavity, is separated from the upper part of the vagina by only a small layer of tissue and this anatomical fact is utilized by the surgeon when he wishes to drain an abscess in the lower part of the peritoneal cavity without making an abdominal incision. It has been pointed out by some that this proximity of the peritoneum to the upper vagina should be emphasized to all nurses as it is possible to force a douche nozzle through

the posterior fornix and inject a douche directly into
the peritoneal cavity. The results of this would be most
disastrous but in our opinion only through the greatest
carelessness and roughness could such an accident occur.

The **uterus** or **womb** is a pear-shaped, hollow, muscular
organ made up chiefly of muscle and fibrous tissue. It is
divided into two portions, the cervix or neck and the
corpus or body. The top of the uterus is sometimes spoken
of as the fundus and the angles on each side of the fundus,
where the fallopian tubes join the uterus, as the cornua.
The cervix, or what corresponds to the stem of the pear,
dips down into the vagina, while the large rounded part
of the uterus lies in the abdominal cavity and is covered
by peritoneum. During pregnancy the uterus contains the
fetus and in the nongravid menstruating woman it gives
off the menstrual blood.

The normal nonpregnant uterus measures three inches
in length, two inches in breadth, and about one inch in
thickness. In the virgin it weighs about 45 gm. or one
and one-half ounces, while in the woman who has borne
children two ounces is the average weight. The uterus is
traversed by a cavity which extends from the external
os of the cervix through the body of the uterus to the two
uterine cornua where the womb joins the fallopian tubes.
This cavity is lined by a velvety mucous membrane of
two different types, one variety covering the cervical
canal, the other lining the body of the uterus. The two
types of epithelium meet at the internal os of the cervix,
which is the point where the cervix joins the body of the
uterus.

The epithelial mucous membrane lining the body of the
uterus is called the endometrium. It is a very important
structure for it is in the endometrium that the fertilized
ovum is embedded and from which it receives its nourish-
ment. The lining of the pregnant womb is spoken of as

Fig. 3.—The pelvic viscera. The uterus lies between the bladder and rectum. In the angles at the sides lie the fallopian tubes and ovaries. (Kelly, Howard A. *Operative Gynecology*. D. Appleton Company.)

the decidua but this is really only a modified endometrium.

The mucous membrane lining the cervix is called the endocervix, and when it is infected the patient is said to have endocervicitis. As the cervix is often lacerated at

childbirth and then secondarily infected, and as in gonorrheal infections the cervix is one of the first areas to be involved, endocervicitis is a condition which is often seen by gynecologists. Moreover, carcinoma develops so often in the cervical epithelium that cancer of the cervix is responsible for more deaths from malignancy than is any other type of cancer seen in women. Hence, the gynecologist always palpates the cervix with great care, noting its consistency and whether or not it has a regular or irregular outline. In addition he introduces a speculum into the vagina and carefully inspects the cervix.

The womb does not receive its blood supply from only one artery as is the case with some organs but through two large paired sets of vessels, the uterine and the ovarian arteries. Perhaps this unusually good supply was provided in order that the uterus might be able to undergo the tremendous increase in size which occurs with pregnancy. The normal position of the uterus is forward, with the body meeting the cervix at an obtuse angle. It is held in this position by a series of ligaments. The most important of these are the round, broad, uterosacral and utero-ovarian ligaments. All of these are at least in part intra-abdominal, being covered with peritoneum.

The *round ligaments* are of special interest to the gynecologist, as they are utilized in so many of the different surgical methods that have been devised for suspending the uterus. They arise one on each side from the anterior surface of the womb, just in front of the insertion of the fallopian tubes. In a way they might be considered as simply the upper portions of the broad ligaments, as they lie in the folds of peritoneum that extend on either side from the uterus to the pelvic wall. However, it seems better to consider the round ligaments as separate structures. They vary considerably in size in different women. Some times they are as large as one's little finger while occasionally, even at their uterine ends,

they are only a few millimeters in thickness. They pass outward and forward through the abdominal cavity leaving the latter by the internal inguinal openings. They then extend through the inguinal canals and finally thin out and disappear in the subcutaneous tissue of the mons veneris and upper part of the labia majora. They are strongest and largest where they join the uterus and thinnest and weakest at their distal ends.

The *broad ligaments* extend from the sides of the pelvis to the uterus, dividing the pelvic cavity into anterior and posterior halves. They contain a large amount of unstriped muscle and fibrous tissue and help hold the uterus in proper position. They are occasionally used by the gynecologist in suspensory operations although not as often as are the round ligaments.

The *uterosacral ligaments* are two cordlike structures which pass backward from the posterior surface of the uterus to the second sacral vertebra. By their upward traction on the posterior lower part of the uterus they help to keep the body of the womb forward.

The *utero-ovarian ligaments* are small folds that extend from the uterus to the ovaries. Their most important function is to keep the ovaries in their normal positions and to prevent them from prolapsing down into the cul-de-sac or lowest portion of the peritoneal cavity.

The **fallopian tubes** or oviducts are the passageways for the egg or ovum from the ovaries to the uterus. They lie one on each side in the upper portion of the broad ligaments and join the uterus just a little behind the insertion of the round ligaments. Their average length is about four inches. The peritoneum which covers the body of the uterus extends out over the length of the fallopian tubes to their distal fimbriated ends. There are some differences in the mucous membrane that lines the tube and that which lines the uterine cavity, perhaps the most important being that numerous cilia or small fingerlike

threads project from the tubal mucosa. These have the function of propelling the ovum through the tube toward the uterine cavity. It is worth while pointing out that the fimbriated or upper end of the tube opens directly into the peritoneum while the lower or uterine end of the tube connects with the uterine cavity and through it with the vagina and the outside. Because of this the peritoneal cavity in women is not a closed cavity as it is in the male. This difference in the anatomy of the peritoneal cavity of the two sexes explains why it is that some types of peritonitis occur so much more frequently in the female. The fallopian tubes are normally tortuous, but any unusual tortuosity or any adhesions kinking the lumen may cause serious trouble, for if a fertilized ovum is stopped on its journey toward the uterus an ectopic pregnancy may develop.

The isthmus or first part of the tube emerges from the lateral angle of the fundus or dome of the uterus just above the uterine attachments of the utero-ovarian and round ligaments. It is narrow and has a lumen of small diameter. Beyond is the ampulla, the diameter of which gradually increases until the tube suddenly expands into the trumpet-shaped, terminal fimbriated end, so called because of the long irregularly shaped processes or fimbriae which hang down from it.

The **ovaries** are two almond-shaped organs suspended from the posterior surface of the broad ligaments and attached to the uterus by the utero-ovarian ligaments. Their size and weight vary during the different stages of life, being larger during the menstrual life of a woman and smaller before puberty and after the menopause. In general they are about two inches in length and from one-quarter to one-half an inch in both breadth and thickness. They weigh from six to eight grams. There are two distinct parts to an ovary, which differ not only in anatomical structure but apparently also in function. The

inner portion or medulla is made up of blood and lymph vessels and connective tissue. As yet we do not know of any specific function of this part of the ovary.

The cortex or outer portion of the ovary contains numerous minute sacs or follicles in each of which there is an immature ova or egg. These sacs are spoken of as the Graafian follicles. The most important thing to know about the Graafian follicles is that each month during menstrual life one follicle is signaled out from all the rest to complete its full development, to rupture and discharge its egg into the peritoneal cavity from where the egg is drawn into the distal end of one of the fallopian tubes.

When a Graafian follicle ruptures and the ovum and follicular fluid with which it was filled is discharged, a cavity is left in the cortex or outer portion of the ovary. This cavity is at once partially filled by blood from the small vessels that are torn when the outer wall of the Graafian follicle ruptures. At the same time some of the cells which had made up the outer wall of the follicle now increase in number and become filled with a pigment which gives them a definite yellow color. These cells are then known as lutein cells, and the structure that develops at the site of the old Graafian follicle is now spoken of as the corpus luteum. Unless the woman becomes pregnant during the menstrual cycle this corpus luteum develops for only a short time and then gradually becomes smaller and smaller. On the other hand, if conception occurs the corpus luteum increases in size and persists throughout the entire pregnancy. It is then known as the corpus luteum of pregnancy.

From this it is evident that with a Graafian follicle undergoing full development each month, a corpus luteum being formed and then degenerating, the ovaries are in constant activity during the menstrual life of a woman. It is because of these constant changes that the outer surface of the ovary so often shows great irregularity. Little

knobs or projections can be seen and palpated in most instances. The color of the ovarian cortex is gray, but if any corpora lutea are present they can be recognized by their yellow color. While we have described what happens to a Graafian follicle which is selected to undergo full development, it must be remembered that many of the ova found in the ovaries of a newborn child never reach this stage, and this is as might be expected for every infant contains in her two ovaries about one hundred thousand potential eggs.

While discussing the ovary, mention might be made of a small structure called the parovarium which can often be seen lying between the ovary and fallopian tubes. It has no known function and is of importance only because it not infrequently becomes filled with fluid and develops into a cyst which may reach the size of an orange. It may then cause the patient considerable distress and its operative removal becomes necessary.

The *mammary glands* when morphologically considered are merely modified cutaneous or skin glands that develop in both sexes. However, the functional importance of the breasts in women entitle them to be included in the female reproductive apparatus. In a young well-developed woman before the occurrence of pregnancy, the breasts form two hemispherical projections that lie on either side of the sternum or chest bone. They extend from the outer borders of the sternum to the inner margins of the axillae and from the second rib above down to the sixth rib. The rounded contour of the breasts depends chiefly on the fat which forms a complete envelope for the glandular tissue everywhere except beneath the nipples. The summit of each breast is marked by a conical projection called the nipple. Each breast is made up of a group of twenty or more individual and separate glands, opening to the outside by independent lactiferous ducts at the nipple. The latter is about one cm. in height and is surrounded by a

zone about three cm. in diameter, called the areola of the breast. In it can be seen many low elevations caused by some small subcutaneous glands called the glands of Montgomery. The pigmentation in the nipple and surrounding areola is very slight in the young woman who has never borne children but this varies somewhat with the complexion of the individual. In the early months of pregnancy the color of the nipple and areola changes to brown of varying shades of intensity, which tint thereafter never completely disappears.

The surgery of the breast comes in the province of the general surgeon and it is the obstetrician who is especially interested in the care of the mammary glands during pregnancy and lactation. However, the examination of the breasts constitutes an important part of every gynecological examination, for the presence of colostrum may prevent the woman specialist from mistaking an early pregnancy for some other condition or may aid him in the early diagnosis of tubal gestation and perhaps thereby, through a prompt operation, may save a human life. Moreover, gynecologists have recently become greatly interested in the relationship of certain changes in the breast to disturbances in the internal secretion of the ovaries.

The gynecological surgeon is interested not only in the generative organs but also in the other structures whose proximity to his field of work places them in danger when he is operating unless he exercises the greatest care. Among such organs the *bladder* comes first in order of importance. Placed directly in front of the uterus with the upper part of its peritoneum attached directly to the lower part of the womb it is an organ which must always be reckoned with by the pelvic surgeon. It is essentially a muscular bag lined with mucous membrane, which forms a receptacle for the urine being constantly secreted by the kidneys. When sufficient urine has accumulated in the

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bladder the patient feels the desire to void and empties the bladder. Even in health there is considerable variation in the amount of urine which different women can hold without experiencing a strong desire to micturate. In urinary infections the bladder capacity is often markedly reduced while, on the other hand, in the postoperative complication known as urinary retention, the amount of fluid retained may be so great that the bladder forms an abdominal swelling, rising at times as high as the umbilicus. The bladder when empty is tucked away behind the symphysis pubis and held in position by the ligaments under it, but if these ligaments are injured in childbirth the bladder descends from its normal position to form what is called a cystocele, which is nothing more than a hernia into which the bladder protrudes.

The **ureters** are the tubes carrying the urine from the kidneys to the bladder. They enter that part of the posterior bladder wall which is known as the trigone. The internal urethra, the opening through which the urine in the bladder flows into the urethra, is also located in the trigone. It is because the two ureteral orifices and the internal urethra are so placed with regard to each other as to form a triangle that this portion of the bladder is called the trigone. It is essential to know the exact location of the ureters whenever the uterus is to be removed, otherwise they may be injured by the surgeon. They pass on either side from the pelves of the kidneys through the retroperitoneal tissue and pierce the bases of the broad ligaments before entering the bladder. It is important to remember that the ureters pass under and not over the uterine arteries. Doctor T. S. Cullen emphasizes this relationship to medical students by saying that "water passes under the bridge."

The **urethra** in the female is only one and a half inches long. It is a muscular tube lined with epithelium and is in close contact with the anterior vaginal wall. It drains

FIG. 4.—Sagittal section through female body showing the normal position and relations of the uterus, bladder, rectum, and abdominal walls. The dotted line represents the outline of the pelvic bones. This drawing shows that only a small layer of tissue separates the upper part of the vagina from the lower part of the peritoneal cavity. (Kelly, Howard A. *Operative Gynecology.* D. Appleton Company.)

the urine from the bladder to the outside. The control of the urethra is dependent upon two muscles, the external and internal urethral sphincters, of which the latter is

more important. In severe injuries at childbirth these muscles may be torn and urinary incontinence develop.

The **kidneys** are two bean-shaped organs situated deep in the loins behind the peritoneum and on either side of the vertebral column. They are covered by a fibrous capsule and surrounded by loose connective tissue. The right kidney normally extends down a little lower than does the left. Each weighs about 150 gm. (3½ oz.) and is about 11 cm. long, 6 cm. wide, and 4 cm. thick. Lying directly above the upper extremities or poles of the kidneys are the adrenal glands which secrete adrenalin, a product essential for the maintenance of life.

The kidneys are selective filters. They remove from the blood waste products and excrete them in the urine in the following manner: A large vessel known as the renal artery enters each kidney through the hilum or cleft in the middle portion of the medial surface of the organ. The vessel then extends upward towards the cortex or outer portion of the kidney, gradually dividing into smaller and smaller branches until they ultimately terminate in little tufts, known as glomeruli, of which there are a large number. Each glomerulus is in close connection with a tubule of the urinary tract. The impurities in the blood pass from the small glomeruli to the urinary tubules, and the purified blood then returns to the general circulation through the renal veins. The small branches of the urinary tract into which these waste products have been emptied now unite with each other until larger and larger ducts are formed. From these the urine flows into the large urinary receptacles known as calyces, then into the kidney pelvis, and finally into the ureter and bladder.

The *rectum* and *sigmoid,* which together form the lower part of the intestinal tract, lie in the neighborhood of the generative organs. Normally the large gut extends upward in the pelvis behind the uterus and then turns toward the left lower quadrant. However, inflammatory

conditions may cause such adhesions between the lower intestine, uterus, tubes, and ovaries that at operation it is sometimes difficult to separate these structures from each other and unless the surgeon is extremely careful he may injure the intestine. Moreover, some of the pathological conditions in the lower intestine may cause symptoms similar to those that result from gynecological lesions. The hemorrhoidal arteries carry blood to the rectum while the blood is carried away by the hemorrhoidal veins. When the latter become clogged and infected they form hemorrhoids or what are generally known as piles. The large gut opens to the outside through an opening called the anus. This opening is kept closed by a spherical muscle, the sphincter ani. Anterior to the anal canal is the perineum separating the vagina and rectum. Serious tears at childbirth sometimes extend all the way through the perineal body and sphincter ani muscle into the rectum itself. Such tears until repaired leave the unfortunate woman with no fecal control, so of course every effort is made by obstetricians to avoid such lacerations.

Other abdominal structures of interest in gynecological surgery are the appendix and the omentum. The former is important because it is often drawn down into the pelvis in pelvic inflammatory conditions and because in many instances the differential diagnosis between appendicitis and salpingitis is an important but not an easy one to make. The omentum is an apron of fat which hangs down from the transverse colon. The distal end of this apron normally lies free in the peritoneal cavity, but whenever there is trouble the omentum goes at once to the infected area and attempts to localize the infection and thus prevent general peritonitis.

## PHYSIOLOGY OF THE FEMALE REPRODUCTIVE
## ORGANS

Except for the genital organs there are until *puberty* only slight anatomical differences between the human male and female. Moreover, up to that time the interests and tastes of girls are not so vastly different from those of their young brothers. However, with the onset of puberty the female undergoes a tremendous change. The breasts become more prominent. The bony pelvis broadens so as to permit childbearing. The thighs become rounded out and there is an increased deposit of fat over the mons veneris. The pubic hair increases in amount. There is some change in the quality of the voice but this is not as marked in girls as it is in boys. Sometimes in girls a temporary enlargement of the thyroid gland is noticeable.

Sex consciousness now makes its appearance and with its advent there may be some emotional instability. The developing girl is apt to become shy and introspective, to laugh, giggle, or cry under very little provocation. It is at this time that the proper handling of the young girl by her parents and teachers is of such tremendous importance. A lack of understanding or an unsympathetic attitude on the part of those about her may be a contributing

factor toward a neurosis in later life. Every effort should be made to protect her from excessive physical and mental strains.

The **onset of menstruation,** while only one of the manifestations of puberty, is considered by people in general as its outstanding sign. It usually appears at the age of thirteen or fourteen but in some apparently normal girls menstruation starts as early as the eleventh year, while in others it does not commence until the fifteenth year. Variations in the onset of the menstrual function beyond these limits, namely the eleventh to the fifteenth years, indicate the likelihood of congenital anatomical defects or endocrine disturbances.

The menses usually recur at a twenty-eight day interval, but many normal women menstruate every twenty-seven days, others every twenty-nine. Occasionally we see perfectly healthy women who menstruate every three weeks, and then others who do so only once in every thirty-five days. The normal adult woman usually menstruates quite regularly at the same intervals of time. However, it is not uncommon during the first year or two after the onset of the menstrual function for young girls to occasionally miss a menstrual period until the regularity of the cycle is well established.

The duration of the flow is normally from three to six days and usually the bleeding is most profuse on the second and third day. The amount of blood lost varies in different women from 60 to 240 cc. (2-8 oz.). As a rule menstrual blood does not coagulate unless the amount lost is excessive or pathological.

In a normal woman the discomfort associated with menstruation is slight. It consists of a sense of weight in the pelvis and of a mild lassitude. Actual severe pain is not normal although many women complain of it. Accompanying the changes in the pelvis there is apt to be some

swelling of the mammary glands which may give discomfort.

Whenever a woman has severe incapacitating abdominal pains or backache with her menstrual period she should have a pelvic examination. If this reveals a malposition of the uterus, a tumor, or evidence of inflammation, proper treatment should be instituted. There are, however, many women who have severe dysmenorrhea or pain with their periods and still a pelvic examination reveals no abnormality. These women are said to be suffering from primary dysmenorrhea in contrast to the dysmenorrhea caused by recognizable pathological conditions. The treatment of both primary and secondary dysmenorrhea will be considered in another chapter, while here we will discuss the care or treatment of the normal woman who has a moderate amount of discomfort when she menstruates and yet is not incapacitated by severe pain.

This subject, namely the *care of the menstruating woman* is one on which authorities hold different opinions. On the one hand there are those who believe that during this time a woman should have special treatment and care, should rest as much as possible, take very little exercise, be given hot-water bottles and sedatives. In other words she should be invalided to some extent. At the other extreme we have those authorities, among whom are included many of the women physicians and teachers associated with women's colleges, who resent the implication that normal women need to be coddled at this time or that their efficiency during any part of the month is lowered by the fact that they menstruate. Indeed they contend that the best way to produce neurasthenia is to pay too much attention to menstruation and they advise that it be considered as simply a normal rhythmic physiological process during which particular consideration is neither necessary nor desirable. One writer expresses

this view as follows, "Perhaps a most influential factor in fostering a chronic dysmenorrhea, particularly among college or boarding school girls, is the too common recurrent sympathy."

It would seem to the authors of this book that the safest viewpoint to take toward the function of menstruation lies somewhere between the two extremes mentioned above. There is no doubt that by considering menstruation a normal physiological process, not deserving too much attention, many women would be made happier, more comfortable, and more efficient. Still it does seem that as long as a woman continues with her work or household duties there can be little harm in her taking an occasional aspirin tablet or even 32 mgm. (½ gr.) of codeine if by so doing she is relieved of discomfort.

One question that arises in regard to the care of the menstruating woman is whether she can bathe during the menstrual period, and the answer is unequivocally *yes*. A warm bath makes her feel much better. If she is accustomed to daily cold plunges, they may be continued during the period but they are not to be recommended. Should a woman participate in athletic contests while menstruating? There is no reason why she should not walk as much as she wants to during this time, but it is probably better for her not to take part in competitive athletic games when she is menstruating. There are, however, many women athletes who completely disregard their menstrual period in this respect and apparently do themselves no harm.

The use of inexpensive lightweight cellulose sanitary pads, has become so universal that women are apt to forget that most of the mothers and all the grandmothers of the present generation had to put up with the inconvenience of nondisposable cloths which in most instances were saved and washed. While the introduction of the cellulose pads has been a great blessing, there is neverthe-

less an occasional woman who develops irritation of the vulva from their use. These women should lay a few layers of fine tissue paper on the surface of the cellulose pad to prevent its immediate contact with the skin.

In the past few years more and more women have been inserting into the vagina cigarette-shaped plugs of tightly rolled cotton or cellulose. They obviate the annoyance of an external pad and if worn for only a few hours are probably harmless and definitely advantageous to professional dancers and athletes. Nevertheless, most gynecologists feel that their routine use as a substitute for external pads is not to be recommended. Certainly they should not be used by girls with intact hymens and often they cannot be used by parous women with relaxed vaginal walls. Moreover, most women find that they need more protection than is afforded by these plugs during the first few days of the period when the flow is heaviest. Only as the flow is tapering off are the plugs sufficient by themselves. When they are used it is very important that they be changed frequently, otherwise they will cause vaginal irritation and perhaps set up infection.

There are many theories as to the **cause and function of menstruation,** most of which are of interest only from an historical point of view. For instance, there is the ancient belief that the menstrual cycle is controlled by the lunar cycle because the two happen to be usually of about the same length. Another theory that has been discarded is that women at menstruation get rid of injurious products. The real function of the menstrual cycle is to prepare the endometrium or lining of the uterus for the reception of a fertilized ovum or egg, and if no such ovum reaches the uterus in a certain period of time everything that has been prepared for its arrival is thrown off and menstruation occurs. In a sense, every month a woman has an early miscarriage made up, however, of only maternal elements or, to put it differently, a woman men-

struates because she has not conceived during the month.

The menstrual blood comes entirely from the endometrium or mucous membrane of the body of the uterus. There is no periodic bleeding from the cervix or vagina. Menstruation as a matter of fact is the result of a series of cyclic changes which the endometrium undergoes, for the latter is never idle and if examined microscopically just before the onset of menstruation will present a very different picture from that seen after the flow ceases. The cyclic changes which the endometrium undergoes can best be understood if described as though occurring in four stages or phases, but it must be remembered that actually there are minor variations occurring every day.

In discussing these four stages of the *menstrual cycle* it is customary to start with the postmenstrual phase which follows the cessation of the actual bleeding. It lasts about five days. The endometrium, or mucous membrane lining the body of the uterus, is now very thin as a large part of it has been cast off with the menstrual blood. The uterine glands are small, straight, and narrow. Following this comes the interval stage which lasts about two weeks. During this time the endometrium gradually increases in thickness and the glands become larger and more tortu⁍ ous. In the latter half of the interval stage the cells lining the uterine glands begin to secrete, and microscopic sections show this secretion in the act of pouring from the cells into the lumina or cavities of the glands. The third or premenstrual phase is of five days' duration, during which the endometrium reaches its greatest thickness and the tortuosity of the glands is very marked. Menstruation brings the cycle to an end and with it there is a crumbling away of the endometrium and a large part of the mucous membrane is cast off with the menstrual blood.

One can understand from what has been said about the changes that the uterus is constantly undergoing, how important it is for the nurse in the operating room to
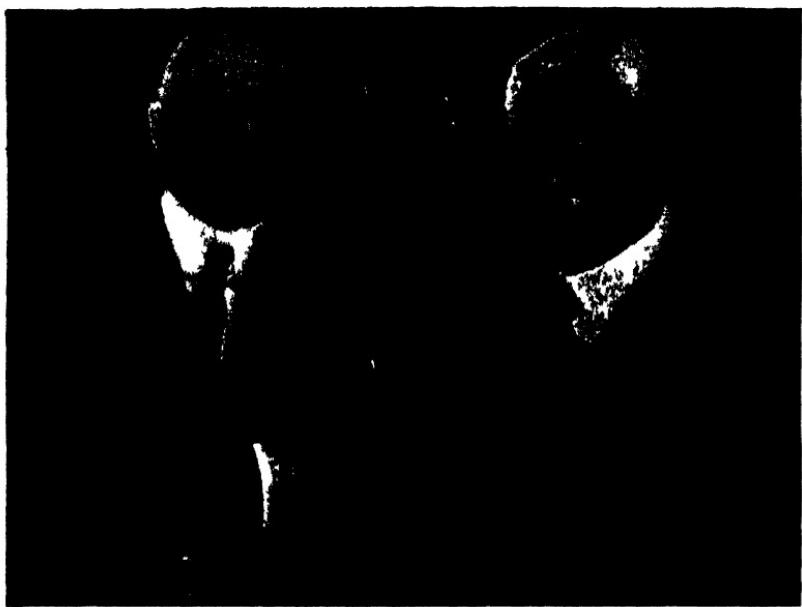
*Thomas Cullen   Howard A. Kelly*

place on every gynecological specimen sent to the laboratory the exact date of the patient's last menstrual period. This is perhaps particularly true in cases in which a diagnostic curettage has been carried out because of irregular bleeding. What the pathologist sees when he examines curettings, the material obtained by scraping or curetting the uterus, will vary greatly according to the phase of the menstrual cycle at the time of operation. A microscopic picture normal for one phase of the menstrual cycle might be abnormal if seen during another phase.

In recent years it has been definitely proved that the Graafian follicle which contains the ovum ruptures and extrudes the ovum or egg from the ovary between the twelfth and eighteenth day after the first day of menstruation. Usually there are no symptoms associated with ovulation but an occasional woman does experience some discomfort at this time and has what is called "Mittelschmerz." Once in a great while considerable bleeding occurs when the Graafian follicle ruptures and the woman may experience the symptoms and show the physical signs of an ectopic pregnancy, for in both conditions bleeding into the peritoneal cavity occurs. Surgery is indicated in the treatment of painful ovulation only when there is considerable internal hemorrhage. Unfortunately, many of the cases in which only slight internal hemorrhage occurs are incorrectly diagnosed as appendicitis and subjected to an unnecessary operation.

This knowledge of the exact time that the egg leaves the ovary is of clinical importance not only because it helps us avoid unnecessary operations through mistakes in diagnosis but also because it enables us to treat more intelligently patients who complain of sterility. Through this knowledge it has been demonstrated that during only part of the menstrual cycle are women fertile; during the rest of the cycle they are sterile. There may be occasional

rare exceptions to the above statement but for the most part it is true.

As was brought out in the chapter on anatomy, when ovulation occurs through the rupturing of the Graafian follicle a new structure known as the *corpus luteum* develops in the ovary at the site of the old follicle. This new structure is of as much importance in the second half of the menstrual cycle as the Graafian follicle is in the first half. One of the main functions of both the corpora lutea and the Graafian follicles is to produce substances called hormones or internal secretions which enter the blood stream and are carried to other parts of the female generative tract, over which they exercise a definite influence.

According to our present ideas of menstruation, the internal secretions of the ovaries and other hormones produced by other members of the so-called endocrine system, or glands of internal secretion, regulate and control the menstrual cycle. The hormones from the anterior lobe of the hypophysis or pituitary gland, a little organ situated at the base of the brain, play one of the most important parts of the process.

It has now become customary to speak of the internal secretions of the Graafian follicles as **estrogens,** of which there are probably three, namely, estrone, estriol and estradiol. Before it was realized that there are several of these estrogenic substances which chemically differ somewhat one from another, the Graafian follicle secretion was called theelin or folliculin. Occasionally we still hear the estrogenic substances spoken of as the female sex hormone but they do not deserve the exclusive right to be so designated.

After the Graafian follicle ruptures, the corpus luteum starts to secrete estrogenic substances but it produces in addition a second hormone called progestin. The estrogens affect the entire menstrual cycle. However, as pro-

gestin is not formed until the corpus luteum develops, which is approximately about the fifteenth day of the menstrual cycle, it of course affects only the second half of the cycle.

The division of the menstrual cycle into the postmenstrual, interval, premenstrual and menstrual phases which has been described is based on anatomical differences which can be detected by microscopic examination. Some authorities prefer dividing the cycle on physiological rather than anatomical grounds and speak of the menstrual phase during which bleeding is occurring, of the proliferative phase which extends from the end of menstruation until ovulation occurs, and of the secretory phase extending from the time of ovulation until the onset of the next period. The menstrual cycle is thus divided into three instead of four phases. Figure 5 illustrates this.

It is important to understand that while menstruation and ovulation occurs separately they are intimately connected with each other. The most characteristic feature of menstruation is the regular appearance of uterine bleeding at intervals of approximately every four weeks. Menstruation is a phenomenon that occurs only in women and some of the higher primates, as the rhesus monkey. Animals like the dog do not menstruate but "go into heat."

Heat, or estrus as it is scientifically called, originally meant only one thing, a restricted period of mating activity in female animals. However, the term gradually acquired additional meaning until now it is applied to the secondary changes that occur at estrus just as much as it is to the intense sex urge which originally was the one development which the term was meant to indicate. For instance, it is well known that many female animals have a marked increase in the size of their sexual organs during this restricted period of mating activity and that some birds show changes in their plumage at this time. Formerly these developments were looked on as incidental

happenings that might or might not take place with estrus, but with the change that has taken place in the meaning of the term any substance that brings about the secondary sexual characteristics is said to be estrogenic or estrus producing.

Strangely enough it is the developments that occur with estrus in the vagina of the mouse and rat that were first used by the medical profession as a means of measuring the strength of preparations claimed to contain these hormones. When for instance the label on a bottle stated that a preparation contained in each cc. one hundred rat units of estrone or some other estrogenic substance, this meant that each one hundredth of a cc. contained enough of this hormone to produce in a rat of definite age, size, and weight, when given over a definite period of time, the changes in the rat's vagina that are characteristic of estrus.

However, before long it became evident that the rat and mouse, or biological, units as they were called did not offer an entirely satisfactory way of measuring the potency of estrogenic substance, so a weight unit was introduced which it was hoped would be more reliable. Actually, the estrogenic potency contained in one ten-thousandth of a milligram of the estrogenic substance estrone was set as a standard and called the international unit.

Unfortunately, even this did not make it possible to compare accurately the efficiency of all estrogenic preparations, for different pharmaceutical houses use different estrogens in their products and even the three estrogens found in human blood and urine, namely, estrone, estriol, and estradiol, do not have the same efficiency milligram for milligram. Moreover, recently some preparations have been made synthetically, that is from chemical and not from biological substances, and some of these synthetic estrogens, such as stilbestrol, are more

powerful than those obtained from the urine and blood of pregnant women and animals. Hence, most drug houses now simply state just what estrogen is in their product and the weight in milligrams of this estrogenic substance in each ampule, capsule, or suppository.

In measuring the potency of preparations containing progestin or the hormone produced by the corpus luteum of the ovary the weight of the hormone in milligrams is also used. The average dose is one milligram although the dosage ranges from $\frac{1}{5}$ mg. to 10 mg. Preparations containing progestin are now being used with considerable success in the treatment of threatened abortion.

The process of menstruation seems complicated enough when we consider that the ovaries secrete two distinct types of substances, the estrogens and progesterone, which keep the endometrium or lining of the uterus changing until bleeding finally occurs. However, to understand fully the mechanism of the menstrual cycle we must go beyond the ovaries and remember that it is the gonadotrophic hormones secreted by the pituitary gland, of which there are probably two, that cause the ovaries to produce the substances that in turn affect the uterus. One of these gonadotrophic anterior pituitary hormones is known as the follicle stimulating hormone as it affects only the Graafian follicle. The other is called the luteinizing hormone as it stimulates the corpus luteum. Figure 5 shows the manner in which the pituitary hormones affect the ovaries and thus indirectly control menstruation.

The true hormones of the anterior lobe of the pituitary gland affect menstruation not by acting directly on the uterus but indirectly through their influence on the ovaries. These products have not been isolated in pure form and it is difficult to obtain sufficient quantities of them for general clinical use. However, substances called the chorionic gonadotrophic hormones have been discovered in the urine and amniotic fluid of pregnant women and animals,

which have properties very similar to, although not absolutely the same, as those of the hormones obtained directly from anterior pituitary gland substances. These hormones obtained from pregnant urine and amniotic fluid are spoken of as the anterior pituitary-like gonadotrophic hormones in contrast to those obtained directly from the hypophyseal gland, which latter alone deserve to be called the anterior pituitary gonadotrophic hormones. What is of great practical importance is that the pharmaceutical houses are now able to obtain these anterior pituitary-like gonadotrophic hormones from urine of pregnancy in sufficient quantity for them to be available to the practising physician. These substances when given hypodermically are sometimes of great help in controlling functional bleeding, a condition in which excessive and irregular uterine bleeding can be related to no definite abnormality, a tumor for example. These hormones are measured in rat units, an average dose being from one to two hundred units.

It is upon the fact that the chorionic gonadotrophic hormone occurs in such great quantities in the urine of pregnant women even when the gestation is only of a few weeks' duration that the *Aschheim-Zondek* and *Friedmann* tests for pregnancy depend. These tests are correct in about ninety-eight per cent of the cases. In this country the Friedmann modification of the test is used oftener than the original Aschheim-Zondek test. In carrying out such a test the first specimen of urine voided in the morning is collected in a bottle and sent at once to a laboratory. A catheterized specimen of urine is not necessary. The urine is then injected into a rabbit and the rabbit's ovaries inspected forty-eight hours later. The presence of large hemorrhagic spots on the ovaries is evidence that the injected urine contained large quantities of chorionic gonadotrophic hormone and that the patient from whom the urine was obtained is pregnant. Of course, this test

does not differentiate between an intra-uterine and an extra-uterine pregnancy. It does definitely show that a pregnancy is present somewhere.

In prescribing any of the hormones that affect the female generative tract some confusion is apt to arise. As already mentioned, each one of these substances has acquired several names from those who have studied them in the research laboratories, and in addition the different pharmaceutical houses have applied special trade names to their individual products even when chemically there has been very little difference between them. For instance, Parke Davis and Company call their product which contains estrone "theelin," while Squibb and Sons call their preparation of the same hormone ''amniotin.'' In like manner the Squibb preparation of the anterior pituitary-like gonadotrophic hormone is called ''follutein,'' while Parke Davis and Company advertise under the trade name of ''antuitrin-S'' the same hormone.

These trade names make more complicated a subject which in itself is complicated enough. However, the important thing for a physician and nurse to know is whether or not an individual preparation containing a hormone supposed to affect the female generative tract has in it estrogenic substances, progesterone, the true anterior pituitary gonadotrophic hormones or the anterior pituitary-like gonadotrophic chorionic hormones obtained from the urine or amniotic fluid of pregnant women or animals. It is also important to note whether the unit used in measuring the dosage is the mouse, rat, or international unit, or whether the dosage is simply stated in milligrams.

Before concluding this discussion of the role played by the internal secretions of the ovaries and pituitary glands in the regulation of menstruation, it must be emphasized that other members of the endocrine gland system also play important parts in controlling sex physiology. Just

how the other members of this group of glands make their influence felt is not entirely understood. We do know, however, that marked derangements of the thyroid or of the suprarenal glands bring about changes in the regularity of the menstrual cycle.

Strangely enough there is no regularity in the type of disturbances caused by definite abnormalities in thyroid function unless these abnormalities are very marked. For instance patients with either hyper- or hypothyroidism may show either amenorrhea or menorrhagia. In some way the thyroid controls the regularity of the menstrual process but when the thyroid is upset the irregularity in sex physiology thus produced may take the form of either too little or too much uterine bleeding.

While more and more is being learned every day in the research laboratories about the endocrine glands and their effects on sex physiology, the results obtained by prescribing clinically the products now available are not consistent and not always very satisfactory. Probably more success has been obtained through prescribing thyroid than by prescribing either ovarian or pituitary products. Thyroid medication is justified when a woman's basal metabolic rate is low or even when it is what might be called a low normal. Many cases of both amenorrhea and menorrhagia have been thus corrected.

Even less is known about the manner in which the suprarenal glands affect sex physiology and as yet practically no results have been obtained in menstrual disturbances by suprarenal preparations. It is important to remember, however, that hyperplasia and tumors of the suprarenal glands may bring about marked changes in sex physiology.

The **menopause** brings to a close the menstrual cycle and about the same time ovulation ceases and the reproductive function is at an end. This period, during which

menstruation ceases, is called not only the menopause but also "the change of life" and the "climacteric."

The termination of the menstrual cycle usually comes on gradually. The periods lessen in amount and are of shorter duration; then the woman misses one or two menstrual periods in succession and this is repeated a few times until the bleeding stops permanently. Occasionally a woman will have regular normal menstrual periods up to a certain date, then suddenly stop and never menstruate again. With the cessation of the periods atrophic changes occur in the whole reproductive system. The uterus itself decreases in size until in elderly women it is less than one-half as large as it is in a woman in her thirties. The uterine mucous membrane becomes flattened and the glands short, straight, and few in number.

Ovulation usually ceases with menstruation so the ovaries of most older women show no maturing Graafian follicles. The vagina and vulva also take part in these atrophic changes. The vaginal orifice becomes narrow and the whole canal contracts. Sometimes adhesions in the upper vagina bind the anterior and posterior walls together and the canal is so closed off that the cervix cannot be palpated. The labia majora or lips of the vulva become flattened through loss of subcutaneous fat. The breasts become smaller and more pendulous.

As with the onset of menstruation so with its termination there are wide variations in the age incidence. Most women reach the menopause around forty-five but any time between the ages of forty and fifty is considered to be within normal limits. Climatic and racial differences play some part in the onset and cessation of menstruation. Jews, no matter in what country they are living, usually have an early menopause. It is claimed that women who begin to menstruate early are particularly apt to have a late menopause but there are many exceptions to this rule.
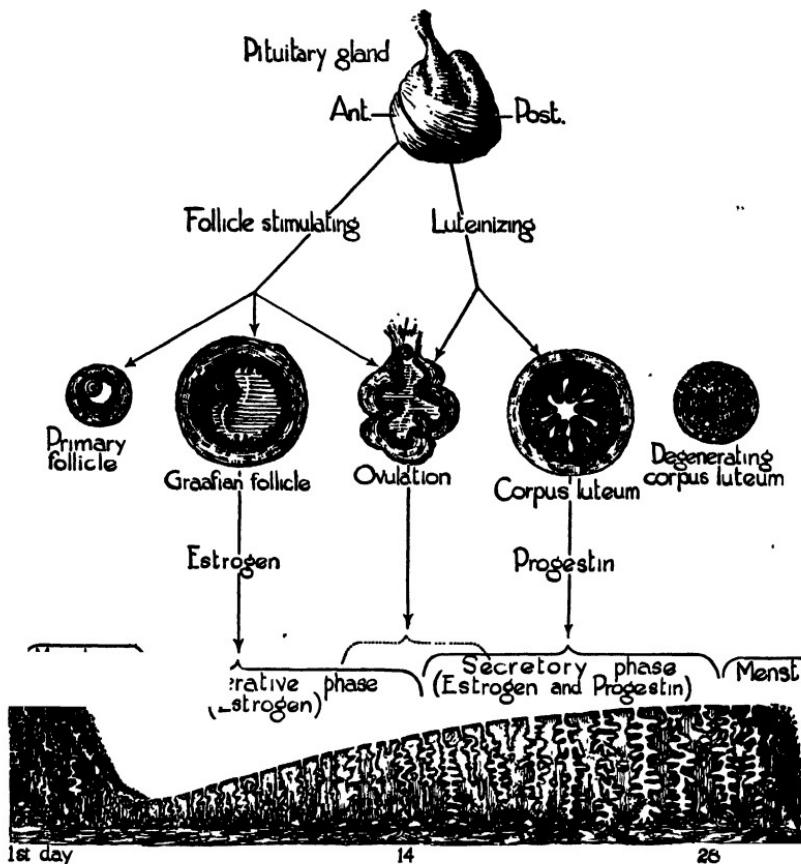
Fig. 5.—Diagram showing phases of menstruation and the relationship of menstruation to ovulation. This also shows how the anterior lobe of the pituitary gland indirectly controls menstruation through its hormones acting on the ovaries.

The severity of the menopausal symptoms varies in different women. Some of those who have cool unemotional temperaments go through this time with little or no difficulty and feel quite relieved that they no longer menstruate. However, the majority of women are at least moderately worried by hot flushes, palpitations of the heart, nervousness, and irritability. In some instances these symptoms stop in a few months, but in others they

# ESSENTIALS OF

# GYNECOLOGY

### BY LEO BRADY, M.D., F.A.C.S.

ASSISTANT PROFESSOR OF GYNECOLOGY, UNI-
VERSITY OF MARYLAND; ASSOCIATE IN GYNE-
COLOGY, JOHNS HOPKINS UNIVERSITY; ASSISTANT
ATTENDING GYNECOLOGIST, JOHNS HOPKINS
HOSPITAL; CONSULTING GYNECOLOGIST, CHURCH
HOME AND INFIRMARY, HOSPITAL FOR THE
WOMEN OF MARYLAND, ST. JOSEPH'S, THE
UNION MEMORIAL AND UNIVERSITY HOSPITALS

### AND ETHNA LOUISE KURTZ, R.N.

HEAD NURSE, BRADY UROLOGICAL INSTITUTE,
JOHNS HOPKINS HOSPITAL, 1930-1935; SUPERVISOR,
GYNECOLOGICAL OPERATING ROOM, JOHNS HOP-
KINS HOSPITAL, 1935-1940

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persist for several years. Fortunately, much can be accomplished towards relieving these complaints by the proper use of products containing estrogenic substances. These are more effective when given hypodermically than when taken by mouth but their oral use is of value provided they are prescribed in sufficiently large doses.

# THE GYNECOLOGICAL HISTORY AND EXAMINATION

A complete and accurate history is of inestimable value in making a gynecological diagnosis. Much of the recorded data is apt at first to impress one as merely part of hospital routine but actually the information obtained is of great value to the consulting gynecologist. The likelihood of certain diagnoses being correct can sometimes be estimated by knowing merely the age and race of the patient. For instance, let us consider a woman who comes to the hospital complaining of pain in the right lower quadrant of the abdomen. If she is of the white race there is at least an even chance that she has appendicitis; but in the negress such a diagnosis would be very unlikely for rarely is the appendix acutely inflamed in the colored race. Examples could be given showing that all the data in a complete history are of value in arriving at a correct diagnosis. However, in gynecology it is the menstrual history that is of special importance. The gynecologist wants to know at what age the patient started to menstruate. Does she menstruate regularly and at what intervals? How many days do the periods last and is the amount of the flow normal? Does the patient have pain during or before the menstrual period? Does any bleeding occur

between the periods? When did the patient last menstru-ate? It is essential that all of these questions be answered accurately.

In recording a woman's complaints there are certain medical terms which the gynecologist often uses and which might be said to belong particularly to his spe-cialty. It is important for the nurse taking care of women patients to understand exactly what is meant by these terms. Those which are used most frequently will now be discussed.

There is perhaps no term that one hears oftener in gynecological parlance than **leucorrhea** and yet strange to say its meaning is often misunderstood. Actually leu-corrhea means nothing more than a discharge from the female generative organs. It may come from the vagina, cervix, or body of the uterus and may be either thick or thin in character. Not infrequently women come to the gynecologist complaining that they have noticed a dis-charge and ask if he thinks they have leucorrhea. If he says that they have leucorrhea he is using a medical term which may impress them but actually he is not telling them anything, for the term leucorrhea does not in any way qualify the type of discharge.

**Dysmenorrhea** means painful menstruation. Once in a great while the gynecologist will have under his care a woman who with every menstrual period passes with the menstrual blood a membrane which has the shape of the uterine cavity. It is, in fact, a cast of this cavity. Such a woman is said to be suffering from *membranous dys-menorrhea.*

**Amenorrhea** is the absence of menstruation. This is normal or physiologic during pregnancy and lactation. The omission of a single menstrual period at any other time between puberty and the menopause is abnormal or pathologic although often it is due to some minor dysfunc-tion of the ovaries.

**Menorrhagia** indicates that with the menstrual period an excessive amount of blood is lost. The period may or may not be unusually prolonged.

**Metrorrhagia** means bleeding between the periods and is usually of more serious significance than menorrhagia. Metrorrhagia is more than the prolongation of a period for a few days beyond the usual duration. It implies vaginal bleeding after the period has definitely stopped.

**Sterility** is the inability to produce young. One speaks of absolute or complete sterility, meaning the inability to have any children and of one child sterility in which the woman never conceives after her first delivery.

*Dyspareunia* is pain on coitus or sexual relations. *Frigidity* indicates the lack of sexual feeling or impulses. A woman may be frigid and still not experience pain on intercourse.

There are four positions in which the patient may be placed for a pelvic examination—the dorsal position, the knee-chest position, the Sims semi-prone position and the standing position. The dorsal position is the one most frequently used. The patient lies flat on her back with, if an examining table is being used, her feet in the foot rests and her knees well drawn up and widely separated. Her hips should be at the lower edge of the table.

An examination of the breasts and abdomen is a part of a complete gynecological study, so all clothing should be removed before the patient is put on the examining table. However, undue exposure should be avoided and only that part of the patient which is being examined at the moment should remain undraped. Except when the breasts are being examined they should be covered with a small towel or chest blanket. The patient should be properly draped with a draw sheet placed diagonally over the lower extremities. She should void immediately before the examination, as a full bladder makes it impossible for the physician to outline the pelvic structures. If it is the

Fig. 6 —Patient prepared for a pelvic examination.

patient's first visit the physician will examine the urine so a specimen should be saved by the nurse.

The Sims position, although first used by the great American gynecologist by that name, has been almost entirely given up in this country but it is still used to some extent in England and on the continent. The patient lies on her left side with her face and breasts on the pillow, the left arm hanging behind her over the edge of the examining table. Both thighs are flexed but the right somewhat more than the left. After the patient has assumed such a position the doctor separates the labia majora. This causes the air to rush into the vagina and to distend the vaginal walls, making it possible to examine the cervix and vagina.

The knee-chest is perhaps the best of all the different

positions in which to inspect the entire vagina. It is of value for vaginal instillations in children with unruptured hymens and is the position used in the Kelly method of cystoscopy.

The standing position is seldom used because only occasionally does it yield any information that cannot better be obtained otherwise. Moreover, it is an embarrassing position for the patient. In an occasional case one can more accurately determine how much the uterus descends into the vagina when the patient is examined standing than when she is examined in any other position. For instance, if a woman feels certain that the uterus descends and the physician finds the uterus to be apparently normally placed he should utilize the standing position before insisting that the woman is mistaken.

The medical student is taught to carry out his examination of the gynecological patient in an orderly routine manner. Only in this way will he avoid overlooking conditions of possibly great importance even though their bearing on the patient's complaints may at first be difficult to see. In other words, there are certain things that should be sought in every patient and this should be done in a definite sequence.

Nurses will find their work more interesting if they know the purpose of every examination. We will accordingly enumerate the more important observations gleaned by the woman specialist in a thorough study of the patient.

A general physical examination should be made on every patient before she is operated on but this is not done routinely by the gynecologist when a patient consults him in his office. He may by palpation outline the thyroid gland in the neck, feel and count the patient's pulse and perhaps take her blood pressure, but even these examinations are not among those that the gynecologist will make on every patient.

The breasts, as has already been stated, should be carefully palpated and then an abdominal examination is made. This starts with an inspection. There may be protrusions of the abdominal wall due to tumors. Sometimes the whole abdomen appears distended; in other cases there is an irregular bulging which may be sharply outlined. Distended veins are sometimes seen and occasionally localized discolorations of the skin.

The patient is asked to breathe deeply and the doctor observes whether the abdomen moves freely or whether the respiratory movements of the abdominal muscles are restricted, as is the case in peritonitis. The examiner then places his hands on the abdominal wall and systematically palpates the entire abdomen, noticing the presence of any firm or cystic masses or of any areas of tenderness. Special attention is given to discovering what is known as muscle spasm, as this is often one of the first signs of inflammation of one of the intraperitoneal structures, such as the appendix. When muscle spasm is marked it can be demonstrated by the examiner pressing lightly with his fingers on the portion of abdomen under which the inflamed organ lies. In a very early inflammatory process muscle spasm can sometimes be best brought out by a sudden release of pressure. When the examiner does this the nurse may observe that after pressing on the abdomen he suddenly takes his fingers away. This maneuver sometimes causes the patient to wince and cry out with pain.

A definite effort is made to palpate the liver, kidneys, and spleen, organs which cannot normally be felt. The right kidney normally comes down lower than the left and its lower edge or pole is so often palpable that this finding of itself has little significance. However, when either kidney drops to such an extent that the whole kidney can be felt and perhaps outlined between the examiner's two
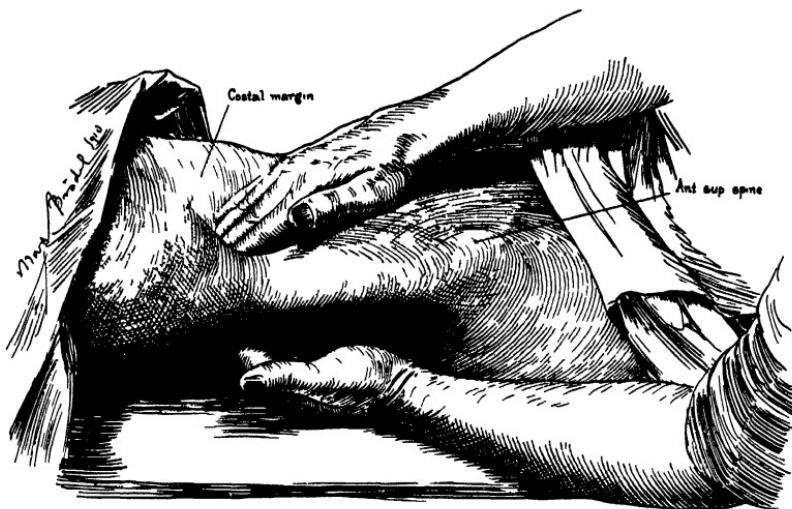
Fig. 7.—Method of palpating for the kidney. A thorough abdominal examination is an important part of a complete gynecological study. When feeling for the right kidney the examiner presses from behind with his left hand, while the right hand is placed just under the patient's costal margin. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder.* D. Appleton Company.)

hands the patient can be said to have a true nephroptosis, a condition which often causes many symptoms.

The examiner percusses over the flanks to determine whether or not there is any free fluid in the peritoneal cavity which, if present, impairs the percussion note. In cases of ruptured tubal pregnancy there is sometimes so, much free blood in the peritoneal cavity that the percussion note over the flanks will be dull or even flat instead of tympanitic as it is normally.

Before introducing his fingers into the vagina the gynecologist inspects the external genitalia, noting if there is any reddening or ulceration of these parts. He pays particular attention to the external urethra for this structure is often invaded by the gonococcus, and a discharge from the urethra suggests a gonorrheal infection. Moreover, a
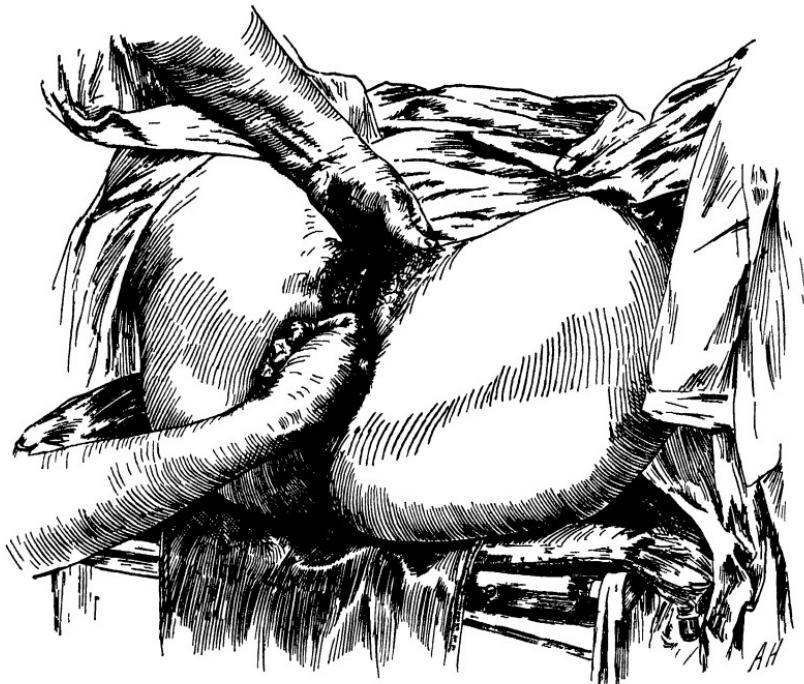
FIG. 8.—The pelvic examination. The doctor is making a bimanual exami
nation of the uterus, fallopian tubes, and ovaries by introducing one hand
into the vagina and placing the other over the lower abdomen. The internal
organs of reproduction are passed between the two hands and carefully out
lined. Most gynecologists prefer to use the left hand in doing a vaginal
examination but some, as shown in this illustration, use the right. (Kelly,
Howard A. *Medical Gynecology*. D. Appleton Company.)

type of small benign tumor called a caruncle not infre-
quently arises from the urethra.

The patient is instructed to close her mouth and bear
down. This enables the gynecologist to see whether there
is any relaxation of the perineum. The lower portion of
the vagina and the labia majora are next palpated and
special attention is paid to the Bartholin glands. When
both of these glands are thickened it is highly probable
that the patient has at some time had a gonorrheal in-
fection.

FIG. 9.—A bimanual pelvic examination of a six-year-old child. The physician places one hand over the lower abdomen and introduces the other into the rectum instead of into the vagina. In a child the entire pelvis can be outlined in this manner. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

The position and consistency of the cervix is next noted. Any unusual hardness, friability, or tendency to bleed should suggest carcinoma to the examiner. The size, contour, and position of the uterus are next determined and the condition of the ovaries and fallopian tubes. In arriving at this information a so-called bimanual examination is made. While one hand of the examiner (usually the left) is in the vagina the other hand is placed over the patient's lower abdomen and thus the internal pelvic organs are passed between his two hands and outlined.

No gynecological study can be considered complete unless it includes a rectal examination. It is often possible

to palpate the pelvic organs more thoroughly through the rectum than through the vagina, especially when the uterus is turned backward. Moreover, there are conditions in the rectum itself, such as strictures, which may produce symptoms similar to those caused by pelvic lesions and unless a rectal examination is made the true cause of the patient's symptoms may not be discovered. In children and in women with unruptured hymens a pelvic examination should be made entirely through the rectum.

There are many laboratory studies which in an occasional case prove helpful to the gynecologist in arriving at a correct diagnosis. Several of these because of their great value are so regularly carried out that they might be considered as part of the routine gynecological examination. Among the tests most generally employed, the examination of smears for gonococci and for trichomonas vaginalis should perhaps first be mentioned. The necessary equipment should always be at hand for carrying out these laboratory studies.

In children suspected of having gonorrhea it is necessary to examine only the vaginal discharge, but in the adult woman it is important to obtain material direct from the urethra and cervix. The physician passes his finger into the vagina and attempts by pressing on the urethra to express some secretion from the external urinary meatus. Then with a cotton swab he transfers this secretion to a glass slide. When the cervix is to be inspected and material from it is to be obtained for microscopic study a bivalve speculum is introduced into the vagina in such a way as to cause the external os of the cervix to present between the blades of the speculum when these blades are spread apart. Then using another cotton swab the physician smears some of the cervical discharge on a glass slide. These two slides, the one containing material from the urethra and the other material

from the cervix, are properly labelled, stained, and examined for gonococci.

There are two **methods of staining gonococci.** The simpler one consists of merely flooding the smears with methylene blue; in the second or what is called the Gram method of staining several different stains are used in succession. While the methylene blue technique is fairly reliable in the search for gonococci in smears obtained from men it cannot be depended upon when a physician is endeavoring to determine whether or not a woman has gonorrhea. This is due to the fact that in a woman's vagina there are normally many organisms which when stained by the methylene blue technique, are indistinguishable from gonococci. Hence, in searching for gonococci in women the conscientious physician stains all smears by the more complicated Gram technique. Bacteriologically this organism is described as a Gram-negative intracellular diplococcus.

If typical organisms are found in a properly stained smear a positive diagnosis can be made, but one negative test does not prove that a woman does not have gonorrhea. When the clinical history and the examination is suggestive smears must be taken on several visits, and one of these examinations should be made either just before or after a menstrual period. Not infrequently gonococci can be found at these times while smears taken during the rest of the month will fail to show them. This indicates that a physician must not be too hasty in concluding that a woman has not been infected or that she has recovered from a gonorrheal infection. In an occasional case in which the physician strongly suspects the presence of such an infection although repeated smears are negative, it is advisable to apply 5 per cent silver nitrate to the external urinary meatus and to the cervix so as to produce a local reaction. This brings to the surface all the organisms lying deep in the tissues and if a smear

is made twenty-four hours later gonococci can often be demonstrated.

When a woman expects a gynecological examination she is apt through a sense of cleanliness to take a vaginal douche immediately before coming to the physician. She may thus unwittingly make diagnosis very difficult. Hence, the gynecologist should routinely ask every patient when she last gave herself a douche. It is especially important to know this when the patient's chief complaint is either leucorrhea or itching of the vulva.

The **trichomonas vaginalis** produce vaginitis but not endocervicitis or urethritis. Hence, when one is looking for these organisms a drop of secretion should be taken from the vagina and not from the cervix or urethra. This drop of secretion may be obtained by suction with a medicine dropper or more simply and just as satisfactorily by the physician introducing his gloved finger into the vagina. It is important that no lubricant be used when such an examination is made because green soap and some of the other lubricants destroy the trichomonas that happen to be in the vaginal secretion and thus make it difficult if not impossible for the physician to recognize the condition. As soon as the vaginal secretion is obtained it is mixed on a glass slide with a drop of normal salt solution and the preparation is at once placed under the microscope. Some gynecologists prefer to use a hollow ground slide when looking for these organisms but any ordinary slide is satisfactory. A cover slip may be placed over this preparation but it is not absolutely essential as the trichomonas can usually be recognized under the low-power lens.

Trichomonas when seen under the microscope can be identified because of their motility and size. They are slightly larger than leucocytes or ordinary pus cells and somewhat smaller than the epithelial cells which line the vagina. Just as in gonorrheal, so also in trichomonas in-

fections; smears taken just before and after the menstrual period are of more value than those taken at other times.

The physician is called on to make no more important decision than whether or not a woman has cancer of the cervix. Sometimes the presence of a bloody ulcerative growth establishes the diagnosis; at other times the cervix looks and feels so perfectly normal that one feels justified in concluding that no malignancy is present. However, in the many instances in which the history and examination are suggestive but not conclusive the diagnosis must be made from the microscopic study of small pieces of tissue removed from the cervix. The physician employs an instrument called a biopsy forceps to remove this tissue.

When a woman is suspected of having cervical carcinoma the physician must use considerable judgment in determining from what area or areas to remove the material for microscopic examination. Schiller, a Viennese gynecologist, in an attempt to aid the physician in selecting the proper sites for biopsy study, devised a test by means of which diseased cervical tissue can be distinguished from the normal cervix. This test now bears his name and today a Schiller's test is almost routinely carried out before taking biopsy specimens. The test, as has been said, distinguishes normal from diseased cervical tissue but as other pathological conditions besides carcinoma, such as cervical erosion, also give a positive Schiller's reaction, the test has not been of as much help as at first hoped. It does in any event point out pathologic tissues which should be removed and sent to the laboratory for microscopic study.

The technique of the Schiller's test is simple. The cervix is painted with Lugol's solution, which is a solution of iodine containing some potassium iodide. This solution may be applied on a large cotton swab or can perhaps
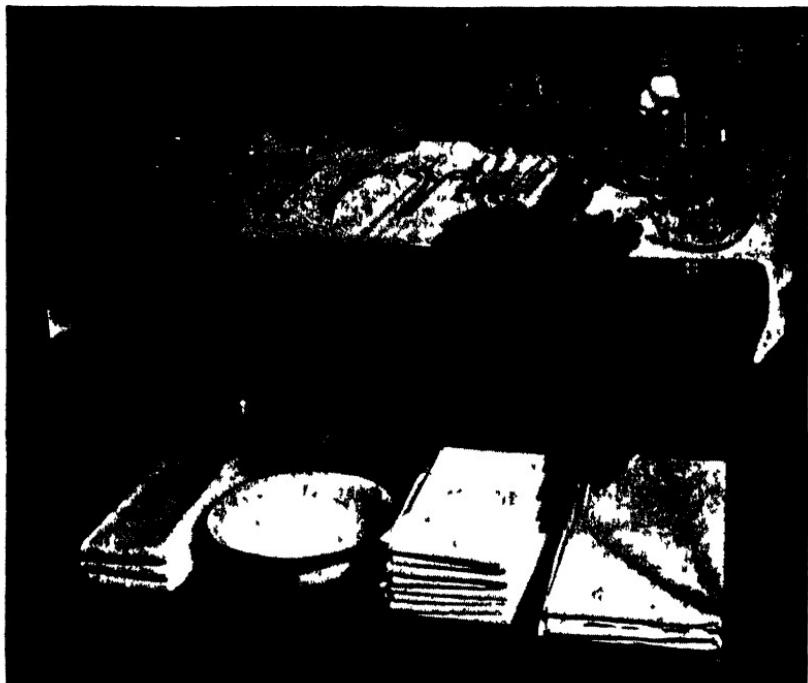
Fig. 10.—The examining table, fully equipped for a gynecological examination.

be better distributed over the cervical tissue with an atomizer. The normal cervical tissue stains a uniformly deep brown, while diseased areas in the cervix do not take the Lugol's solution and, hence, appear either pinkish or white in color.

It is so often necessary to obtain a catheterized specimen of urine and to take a urine culture from gynecological patients that a discussion of these procedures seems indicated in a chapter dealing with examinations. A voided specimen from a woman is of limited value because very often microscopic study will show a moderate number of pus cells which may have come from the vaginal tract and may not indicate any pathologic changes in either bladder or kidneys. However, the technique for ob-

taining a sterile specimen of urine for microscopic study and culture is given in detail in the chapter on female urology, so it will not be repeated here.

The vaginal examination is naturally rather trying and embarrassing to the patient. The nurse can do a great deal towards making the examination successful. She should reassure the patient, be kind and considerate and gain her confidence so that she will cooperate with her doctor.

The articles needed for a complete gynecological examination as shown in Figure 10 are:

> Rubber gloves, well powdered
> Liquid green soap for lubricating glove
> Bivalve speculums for different sizes—to be used in inspecting the cervix
> Bag of small sponges for removing discharge from cervix and vagina
> Kelly clamps for grasping sponges
> Tenaculum for grasping cervix and drawing it downward towards the outlet
> Biopsy forceps—to obtain tissue for microscopic examination
> Specimen bottle containing 10 per cent formalin—to preserve specimen for study
> Glass slides—for making smears
> Sterile applicators in culture tubes for culture
> Small bottle of normal saline with medicine dropper—to obtain material for smear if a trichomonas vaginalis infection is suspected

# GYNECOLOGICAL SYMPTOMS AND THEIR IMPORTANCE

It is essential that a nurse have a clear understanding of the importance of the different gynecological symptoms of which patients complain. So frequently is she called upon for advice that she should be able to differentiate between those symptoms which may be at least temporarily disregarded, and those which strongly indicate that a pelvic examination, by a competent physician, should be carried out without delay. No matter how hesitant a nurse may be about giving advice, nevertheless her counsel is often sought even though informally. For instance, a woman, the friend of a graduate nurse, may tell that friend about her trouble long before she consults a physician. In such instances the nurse is not called on to make a diagnosis, but she should have sufficient knowledge to recognize the relative importance of different complaints and to see the "danger signals" of serious trouble. If when she sees such danger signals she insists on a pelvic examination being made, she renders a great service not only to the friend who has sought her counsel but also to the community at large.

Hence, it seems worth while to devote a chapter of this book to a chronological compilation of the commoner

gynecological symptoms, beginning with those seen in the newborn baby girl and continuing through to those of the aged. This chapter is written with the full knowledge that there will be some repetition of the subject matter in the subsequent chapters which will consider in detail the various gynecological disorders.

The newborn baby girl may have a bloody discharge. This usually appears on the third or fourth day of life, lasts only a day or two and stops, not to recur until with puberty true menstruation starts. It is caused by the estrogenic hormones, present in great quantities in the blood of the mother during the last months of pregnancy, stimulating the endometrium or lining of the child's uterus. It is an occurrence of no importance and a nurse when consulted is justified in telling this to the mother, although of course the attending physician should be notified about it.

**Enuresis** or bed wetting is a condition which causes mothers considerable worry. In many cases it is possible to teach infants urinary control before the end of the first year. Usually, however, this control is not acquired until sometime during the second year and often not until the end of it. If during the third year the child still wets the bed, incontinence may then be said to exist. In some few instances this lack of control is due to serious congenital abnormalities, or to neurological lesions, but in the vast majority of cases this is not so and it may make a mother feel happier if a nurse assures her that there is probably nothing seriously wrong with her child, just because she wets the bed a little longer than most children do. Unless there is some serious abnormality present the treatment of enuresis is largely a matter of training and proper handling of the child with some applied psychology or "common sense," and hence it is that a nurse can often be of great help in correcting this trouble.

A rigid discipline as to habits is all that is necessary

in some cases to effect a cure. The child should lead a simple normal life with no overloading of the nervous system at home or in school. Coffee and tea should be absolutely prohibited. Highly seasoned food should be sparingly allowed or not at all. Liquids should be restricted after 4 P.M. The child should be made to void before retiring and awakened at 10 P.M.

Certain drugs, such as belladonna and strychnine, occasionally bring about cures, but nothing is more important in the treatment of enuresis than getting the confidence of the child and making her feel that those in charge of her are going to succeed in relieving her of her difficulty. Rewards given to the child for dry nights often work wonders. Punishing and scolding seldom do good and may be harmful. The coöperation of the child is essential.

An entire section will be devoted to the consideration of gonorrhea but gonorrheal vaginitis in children should be here mentioned briefly. The symptoms are a thick vaginal discharge and irritation of the vulva, so when nurses are consulted about children with these complaints they must remember that the child, regardless of social status, may have gonorrhea and that she may have acquired it with no reflection on herself or her family.

When a physician discovers that an adult woman has gonorrhea and she denies having had sexual relations, some incredulity on the part of the doctors is perhaps justified. Excepting the gonorrheal infections of the eye this disease is very rarely contracted by any female beyond puberty except through coitus. With children below the menstrual age this is not the case. An occasional girl or young child is infected through sexual attacks by some pervert or fiend, but in ninety-nine out of a hundred cases no sexual tampering of any kind has occurred. This disease is acquired by children through using toilets and linen contaminated by some adult person with gonorrhea.

In some instances the servants in the·household are the source of the infection. The difference in the method by which adults and children acquire this disease should be thoroughly understood by all nurses for, by explaining this, they may remove the suspicion that the child has been molested. It is naturally a terrible shock to parents to learn that their child has gonorrhea, but here again the nurse may give comfort not only by explaining the method of infection but also by assuring the parents that the disease in children responds to treatment much more readily than it does in adults. Moreover, the knowledge that in children this disease remains localized in the vagina and does not extend upward to the fallopian tubes and ovaries will relieve the parents of the fear that the little girl will not grow up to be a normal woman. Incidentally, a nurse should know that the newer treatment of gonorrheal vaginitis, the use of amniotin vaginal suppositories, clears up this condition much more rapidly than does any of the older methods of treatment.

It is of course impossible accurately to determine what percentage of children masturbate, but certainly an appreciable number do. In some instances the habit is a result of improper training or is acquired from other children, but in many cases it starts because of definite anatomical abnormalities and stops when these abnormalities are corrected by the gynecologist. The folds around the clitoris sometimes becomes adherent to each other and a little smegma or cheesy-like debris is caught between these folds and the glans clitoris. This sets up a local irritation which causes the child to rub the parts and if the anatomical condition is not corrected the habit of masturbation may easily be engrafted on the primary trouble. Hence, when a nurse learns that a child has this habit, she should tell the parents that they should not attempt to break the habit through punishing the child but should take her to a physician for examination.

THIS BOOK IS DEDICATED TO
DR. HOWARD A. KELLY AND DOCTOR THOMAS S. CULLEN,
THE FIRST TWO PROFESSORS OF GYNECOLOGY
AT THE JOHNS HOPKINS UNIVERSITY.
BY THEIR SURGICAL SKILL, THEIR TEACHINGS,
AND THEIR ORIGINAL WORK THEY HAVE DONE
MUCH TO RELIEVE HUMAN SUFFERING.

Sometimes masturbation in children results from an infestation with pinworms. The scientific name for this type of worm is oxyuris vermicularis, but in addition to being called pinworms they are sometimes spoken of as seat worms and thread worms. They are about 1 cm. (½ to ⅓ of an inch) in length and look very much like a short piece of white thread. The oxyuris is found most often in the rectum and the lower part of the large intestine but at times it travels upward to the caecum and appendix. The female worms are apt to crawl out of the anus and to attach themselves to the perineal skin and to the genitalia. When the latter happens the vulva becomes irritated. This irritation causes the child to scratch and before long the habit of masturbation may follow. Hence it is that whenever these small worms are discovered, intensive treatment should be at once started to completely rid the child of the infestation.

Probably there is no time during life that advice from a nurse can be more helpful than at puberty. Of course if a young girl does not menstruate until she is sixteen or has severe incapacitating pains or hemorrhages with her periods, expert gynecological advice should be sought; but there are many minor variations from a perfectly normal menstrual history which occur at puberty and which will straighten out if the child and her parents can be reassured that probably no serious abnormality is present. For instance many girls do not menstruate until they are fifteen and if they are otherwise normal there is no necessity to subject them to the embarrassment and their parents to the expense of a gynecological consultation. Then too, in some instances, the menstrual periods after they have started do not at first come regularly. The child may miss three or four periods during the first year, and during the summer when perhaps at a summer camp, she may not menstruate at all. Such ir-

regularities are of no consequence and should receive no attention.

Every child who has reached the age when the onset of menstruation may be expected should be told frankly about it, but should not be made to anticipate its advent with dread. When the child does begin to menstruate the normal routine should be interfered with as little as possible. Sometimes the first few menstrual periods are accompanied with severe pains while later on menstruation may be almost painless. Simple remedies, such as aspirin and a hot-water bottle, may make the child more comfortable, but we do not feel that she should go to bed every month when she menstruates. If the pains are really severe enough to necessitate this, a gynecological consultation is indicated.

There are, as has already been mentioned in a preceding chapter, two types of dysmenorrhea. In the first the pelvic organs on examination show no definite abnormality. The second type reveals either an acute anteflexion or retroposition of the uterus or some abnormality of the fallopian tubes or ovaries. When a woman is suffering from this second type of dysmenorrhea, treatment consists of correcting the abnormal conditions; but when, as in primary dysmenorrhea, the pelvic structures are apparently normal it is not yet clear just how best to relieve the patient's symptoms. Many different drugs and operative procedures have been recommended for primary dysmenorrhea, which is often just as severe as is that produced by demonstrable pathologic changes. Recently hypodermic injections of progesterone and of the anterior pituitary-like gonadotrophic hormones obtained from pregnant urine have been tried by some gynecologists. The rationale for this is that as the estrogens cause contraction of the uterus, while progesterone relaxes it, large doses of progesterone or the hormones stimulating its formation should, when given either hypodermically or

# PREFACE

The senior author has had, in connection with his work at the University of Maryland, the privilege of delivering the lectures on gynecology to the nurses at the University Hospital. This little book is largely a summary of these lectures, augmented by observations which Miss Kurtz and he have made of the part played by the nurses in the Gynecological Operating Room of the Johns Hopkins Hospital.

*Considerable space has been given to describing certain* nursing procedures which are carried out in the gynecological wards but no claim is made that this book is an encyclopedia of gynecological nursing.

Many of the illustrations have appeared in the medical publications of Doctors Howard A. Kelly and Thomas S. Cullen and hence are not new. Nevertheless, the drawings of Max Broedel, the Professor of Art as Applied to Medicine, in the Johns Hopkins University, have in the opinion of the authors never been surpassed and seldom, if ever, equaled. Therefore, the authors feel particularly fortunate in being able to use these illustrations and wish to express their deep appreciation to Doctors Kelly and Cullen for allowing them to do so.

We wish to thank Mrs. Angela Shipley, former Superintendent of the Cystoscopic Clinic at the Johns Hopkins Hospital and now Executive Secretary of the Maryland State Board of Nurse Examiners, and Miss Jane Adamson, the Instructor in Gynecological Nursing in the Johns Hopkins Hospital School of Nursing, for the help and advice they have given. Finally our thanks go to Macmillan and Company for their complete coöperation in the publication of this book.

<div align="right">

LEO BRADY
ETHNA LOUISE KURTZ

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by mouth, stop the cramp-like pains of primary dys-
menorrhea. Some results have been obtained by this
method of treatment but they have not been consistent,
and women are apt soon to tire of repeated series of hypo-
dermic injections continued month after month. Another
hormone which recently has been given to patients with
dysmenorrhea is testosterone, the male sex hormone.
There are some objections to using the male hormone in
female patients but apparently testosterone does relieve
the pains in some cases of dysmenorrhea.

Of the numerous drugs and combination of drugs that
the senior author has used for primary dysmenorrhea he
has found that the following ingredients when mixed in
capsules have been most effective: aspirin 0.3 gm. (5 gr.),
atropine 0.5 mgm. (1/120 gr.), codeine 0.03 gm. (½ gr.)
—one capsule to be taken every four hours.

The patient starts taking these capsules as soon as the
menstrual pains commence and stops taking them when
she gets relief. Individuals vary in their sensitivity to
atropine. Some can take 0.5 mgm. every three hours with-
out experiencing any unpleasant symptoms, while an oc-
casional patient develops dryness of the throat, flushing
of the face, and impaired visual accommodation when
that amount is taken every four hours. When this occurs
the capsules should be taken at intervals of every six in-
stead of every four hours.

The question might be asked, whether there is any
danger of habit formation when a woman takes three or
four 0.03 gm. tablets of codeine every month to relieve
the pain. In our opinion, there is no such danger. In-
stances of codeine addiction have been so very rarely re-
ported that some physicians doubt if codeine in itself is
ever habit-forming.

On the other hand, two of the drugs that are most help-
ful in relieving dysmenorrhea, namely, morphine and
alcohol, are definitely habit-forming and should never be

prescribed. Incidentally, many of the older patent medicines advertised to relieve pain with the menstrual periods owed their efficiency to their high alcoholic content and not to the large number of practically inert substances which they contained.

Some children bleed very freely during the first years of menstrual life and indeed may have profuse hemorrhages. In our experience parents are apt to pay less attention to this complaint than to delayed or irregular menstruation, and it is not unusual to see young children whose parents have delayed seeking medical advice until after a marked secondary anemia has been caused by these hemorrhages. There is at puberty, just as there is during the entire menstrual life, considerable variation in the amount of blood lost each month by different women, but if it is evident that a child is each month bleeding very freely and that her general health is being impaired by this, definite action is strongly indicated.

**Marriage.**—In some future day when a utopian age is reached we may, as suggested in More's book, compel both men and women to submit to thorough physical examinations before they can be married but, although some states at present give the health department the right to insist on an examination of all applicants for marriage licenses, this right is seldom exercised. All practioners of medicine know that a certain number of people marry who have definite congenital defects which absolutely prevent sexual relations. Occasionally these defects are of such a nature as to require surgical correction, but much more often they can be remedied by a little advice or treatment in the physician's office. Frequently, when such marital difficulties develop, the woman through modesty hesitates and often refuses to see a doctor and the condition goes on uncorrected. Then either attempts at sexual relations are entirely discontinued or if persisted in the woman begins to dread them.

Fortunately more and more states are insisting on Wassermann tests before marriage licenses are issued and it is to be hoped that before long all of the states will make such examinations compulsory. In this way may be avoided those terrible tragedies that result from men and women who do not know that they have ever had this disease, infecting their marital partners with syphilis.

**Leucorrhea.**—Except for perhaps a thin, nonirritating discharge, limited to two days before and after menstrual periods, every woman with a leucorrhea discharge should have a gynecological examination. This is urged not because leucorrhea may be the first sign of cancer, for not one in a hundred women complaining of a leucorrheal discharge will be found to have cancer, but because the discharge itself worries the patient and a few office treatments by a gynecologist will often correct the trouble. If with the discharge the patient has itching of the vulva a trichomonas infection should be suspected, although in all cases of pruritus vulvae the very first step in the examination should be to test the urine for sugar. Sometimes this symptom may be the first manifestation of diabetes mellitus.

**Backache** is complained of by so many women that it is difficult in an individual case to decide just how much attention should be given to this symptom. In some ways it would be well if every woman who complained of discomfort in her back would have a thorough examination. Certainly many of them if properly treated would be relieved of their discomfort. This treatment need not necessarily be gynecological. Orthopedic conditions cause just as much backache in women as do retroposition of the uterus and relaxed vaginal outlet. Moreover, one must not hastily conclude, because a particular woman has a backache and her uterus is in retroposition, that necessarily the gynecological condition is the cause of her

complaint. The retroposition may have been of long standing without causing any symptoms and her present condition be due entirely to a sacroiliac strain. This statement is stressed because unquestionably some women with congenital asymptomatic retroposition of the uterus are subjected to unnecessary and useless surgery. However, when it is evident that the retroposition of the uterus is the cause of the patient's backache an operation will relieve her symptoms. Incidentally, it must not be forgotten that in some cases the discomfort in the back is due to neither gynecological or orthopedic conditions but to a low grade pyelitis, ureteral stricture, or some other urological lesion.

**Falling of the womb.**—Every woman who has a small- or moderate-sized cystocele or rectocele does not necessarily need a gynecological operation. If the relaxation is not marked and causes her no symptoms its correction may with safety be indefinitely delayed. However, if the cystocele, rectocele, or slight descensus uteri does cause backache, dragging-down sensation in the lower abdomen, difficulty in urination or defecation, surgery should be strongly urged. Then too, if a patient has a marked descensus uteri, even though it causes her no pain, it is better not to delay operation. Marked relaxations almost always become progressively worse and when the patient finally consults a surgeon, the condition may be difficult to correct.

Many elderly women have marked prolapse of the uterus which causes them considerable discomfort and yet they hesitate to undergo an operation because of their age. The patient's family is apt to say "mother has had this condition for years and because she is sixty-five we think she should not be operated on." So the prolapse is never corrected and the elderly lady passes the rest of her life in considerable discomfort even though she

does not experience any severe pain. If a nurse under-
stands that this condition really causes the patient much
unhappiness, and also knows that such a prolapse can be
corrected through a vaginal operation with, in the hands
of a competent gynecologist, a very low operative mor-
tality even when the women are between sixty-five and
seventy, she will feel justified in urging that such an
operation be performed. Probably the gynecologist has
no more grateful group of patients than those elderly
women on whom he has performed vaginal operations
for uterine prolapse. No longer bothered by a large boggy
uterus protruding down between their thighs, they are
again able to enjoy life.

**Irregular bleeding at the time of the menopause.**—
Many women have very little or no knowledge of the
normal menstrual history during menopause and this
ignorance is very costly for it results every year in the
unnecessary death of many hundreds of women. Symp-
toms which really point strongly to cancer are dismissed
under the heading of "change of life," and the medical
examination is delayed until a carcinoma has become in-
operable and the outlook hopeless. In another part of
this chapter we have stated that a nurse is justified in
minimizing minor variations in the menstrual history of
the child at puberty, but at the menopause no nurse or
doctor is ever justified in doing so. If a woman in her
forties tells a nurse that on one occasion she had a little
bleeding between her periods and that "it really did not
amount to anything," it is that nurse's duty to insist
that the patient at once receive expert medical advice.
That little spotting "amounting to nothing" may be the
first sign of an early cancer, and if the patient's life is
saved either through an operation or by radiation the
nurse who so wisely advised her deserves as much credit
as the physician who attends her. To repeat, at the meno-

pause, any bleeding between the periods, any increase in the menstrual flow, or any increase in leucorrheal discharge, especially if this discharge has an odor, should be investigated not next month but immediately.

The following tabulations enumerate the conditions responsible for those gynecological complaints because of which women most often ask advice from physician and nurses. A detailed account of the conditions causing these symptoms and their treatment will be presented in the chapters that are to follow.

### Causes of Leucorrhea

1. Vaginitis caused by the trichomonas vaginalis. This infection is seen in virgins as well as in married women.
2. Vaginitis due to the gonococcus. This occurs almost exclusively in children below the age of puberty.
3. Senile vaginitis. This is a common cause of a discharge in women beyond the menopause.
4. Polyps. These may arise either from the cervix or body of the uterus.
5. Myomata uteri.
6. Endocervicitis. Some of the infections of the cervix are caused by the gonococcus but many of them are caused by other organisms and are not venereal in origin.
7. Cancer of the cervix.
8. Cancer of the body of the uterus.
9. Retroposition of the uterus.

### Causes of Amenorrhea

1. Uterine pregnancy.
2. Ectopic pregnancy.
3. Constitutional diseases, such as anemia and tuberculosis.
4. Diet deficiencies.
5. Tuberculous salpingitis.
6. Cancer of the ovary.
7. An unusual ovarian tumor called an arrhenoblastoma.
8. Endocrine disturbances, especially those of the ovaries, pituitary, and thyroid glands.

### CAUSES OF MENORRHAGIA

1. Cancer of the cervix of the uterus. This is not one of the commonest causes of excessive bleeding with the periods but it must always be remembered in women beyond the age of thirty. Occasionally it develops in women below this age.
2. Cancer of the body of the uterus.
3. Myomata uteri.
4. Salpingitis especially when the infection is caused by the gonococcus.
5. Polyps arising from either the cervix or body of the uterus.
6. Hyperplasia of the endometrium. This is one of the conditions that most often causes excessive bleeding with the menstrual periods. It is seen especially in young girls who have just started to menstruate and in women approaching the menopause. It is due to a disturbance in the physiology of the hormones that control menstruation. It is treated by curetting the uterus, by giving hormonal preparations hypodermically and occasionally by deep X-ray and radium therapy.
7. Tumors of the ovaries.

### CAUSES OF METRORRHAGIA

1. Cancer of the cervix of the uterus.
2. Cancer of the body of the uterus.
3. Myomata uteri.
4. Salpingitis. Only rarely does an infection of the tubes cause bleeding between the periods. More often it causes menorrhagia.
5. Polyps arising from either the cervix or body of the uterus.
6. Hyperplasia of the endometrium.
7. Retained placenta following abortions or normal pregnancies.
8. Ectopic pregnancy.
9. Tumors of the ovaries.

### Causes of Dysmenorrhea

1. Acute anteflexion of uterus.
2. Retroposition of the uterus.
3. Hypoplasia or underdevelopment of the pelvic organs.
4. Salpingitis.
5. Myomata uteri.

### Causes of Backache

1. Retroposition of the uterus.
2. Myomata uteri.
3. Ovarian cyst.

Backache is caused by orthopedic just as often as by gynecological conditions. Not infrequently it is the result of urological conditions, such as pyelitis, or ureteral stricture.

### Causes of Itching of the Vulva—Pruritus Vulvae

1. Diabetes mellitus.
2. Trichomonas vaginalis.
3. Senile vulvovaginitis.
4. Yeast infections of the vulva.
5. Infestations with pediculus pubis or crab louse.
6. Kraurosis vulvae.

# THE GYNECOLOGICAL INFECTIONS

Although a variety of bacteria occasionally cause infections of the external and internal reproductive organs of women, a few are especially important in that they are responsible for the great majority of all such inflammatory conditions. For example, only three types of infection of the internal sexual organs are commonly seen. These are the gonococcal, the tuberculous, and those associated with childbirth, the so-called puerperal infections. Infections of the fallopian tubes, uterus, ovaries, and the surrounding pelvic peritoneum are often spoken of, collectively, under the term pelvic inflammatory disease. Because practically all the inflammations of the internal organs of reproduction fall into one of the groups mentioned above it seems advisable to consider in detail each of these types of pelvic inflammatory disease.

## GONORRHEA

Gonorrhea is one of the oldest diseases of which we have any record. It was apparently widespread among the ancient Greeks and Romans. Today it is said to be the most prevalent of any of the infectious diseases except measles. It has been estimated that 20 per cent of the total blindness in the world is due to gonorrhea. Probably from 20 to 40 per cent of childless marriages are the

result of this infection. Seventy per cent of all pelvic inflammatory disease is gonorrheal in origin. No age, race, or condition of life is immune.

The **results of gonorrhea,** particularly the blindness occurring in innocent children, seems especially tragic when one considers that the vast majority of these infections could have been prevented. With the exception of the gonorrheal infections of the vagina occurring in the young girl before puberty, and those of the eye, this disease is almost always acquired through sexual intercourse. It is said that gonorrhea in the adult woman has been contracted through using a douche bag belonging to an infected person, but certainly such instances are extremely rare. From this it is inevitable that when a physician sees an adult woman with gonorrhea and she denies sexual exposure, he is apt to doubt her veracity. The disease is particularly common in the colored race and is almost always present in prostitutes. The gonococcus is the infective organism. It is a biscuit-shaped bacterium which in smears shows a characteristic morphology and staining reaction. It is described as a Gram-negative intracellular diplococcus.

The **symptoms of gonorrhea** appear from three to ten days after sexual intercourse. The first areas usually to be infected are the external urethra with the surrounding para-urethral or Skene's glands and the endocervix or mucous membrane lining the cervix. Bartholin's glands are often infected early in the disease but in many instances they are spared. Sometimes the symptoms are so trivial as to be unnoticed and the woman fails to consult a physician. When the symptoms are more marked they consist of burning on urination due to the urethritis and a leucorrheal discharge due to the endocervicitis. There may be some sensation of heat or discomfort in the vulva and in the vagina but, in the adult, gonorrheal vulvitis

and vaginitis, if they occur at all, are of short duration and produce very few symptoms.

The **diagnosis of acute gonorrhea** is made on the history of exposure followed by burning on urination and leucorrhea and on the finding of gonococci in the urethral and cervical smears. Typical Gram-negative intracellular diplococci must be found before one can be certain of the diagnosis although with a typical history the presence of extracellular Gram-negative diplococci is almost conclusive evidence.

When taking smears the physician should ask the patient when she took her last vaginal douche, for many women even though they are complaining of leucorrhea will, through a natural sense of cleanliness, take a complete bath and douche just before coming to a doctor's office, thus unwittingly interfering with the making of the diagnosis. It is also important to know just where in the menstrual cycle the patient is, for sometimes smears taken just before or immediately after a menstrual period will reveal gonococci while smears taken at other times will fail to do so. Cultures for gonococci yield an appreciably larger number of positive results than do smears but special culture media are necessary to grow the gonococcus. One negative smear or culture does not completely exclude gonorrhea when the history and physical findings are suggestive.

As a matter of fact in adult women it is often difficult to find typical organisms, even when there is little doubt of the diagnosis, except in patients seen in the earliest stages of the disease. Moreover, as has already been brought out, many women have very little discomfort during this early stage and fail to consult a physician. This is particularly unfortunate for the great majority of those who are seen soon after they are infected can be completely cured in a short time with sulfanilamide or sulfathiazole.
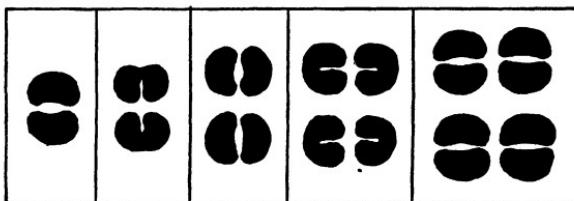
FIG. 11.—The organisms causing gonorrhea—the gonococci. They are biscuit-shaped and show a characteristic staining reaction when stained by the Gram method. The cocci found in pus cells are the most characteristic. Often the gonococcus is described as an intracellular Gram-negative diplococcus. (Kelly, Howard A. *Gynecology*. D. Appleton Company.)

**Gonorrhea in the adult woman may be considered as occurring in two distinct phases,** the second being the more serious of the two. Fortunately, in many instances, only the first phase develops. This, as has been said, consists of an infection of the urethra and cervix and the discomfort associated with it may be slight. If, however, the patient receives no treatment she may harbor the organisms for several years and be a source of infection to others. With the advent of the second stage of the disease the infection extends upward from the urethra and cervix, through the body of the uterus and out into the fallopian tubes, causing inflammation of the tubes which is called salpingitis. The tubes become inflamed and distended with pus. They may become adherent to the posterior surface of the uterus. Due to a firm outer capsule difficult for gonococci to penetrate, the ovaries possess some resistance to the disease and with the first attack of salpingitis they are usually not involved. However,

when ovulation occurs as it does halfway between the menstrual periods, and an ovum breaks through the capsule of the ovary, the organisms may then enter through this tear and the whole ovary be converted into an abscess. Before long the patient may have bilateral abscesses of the tubes and ovaries or what are called bilateral tubo-ovarian abscesses. The uterus becomes fixed by adhesions and the omentum and large and small intestines may become adherent to the pelvic structures. We have thus traced the path of the gonococcus from its original portals of entrance, namely the urethra and cervix, up to the peritoneal cavity.

However, what exactly happens to the internal generative organs after the gonococci have reached the fallopian tubes varies considerably depending on whether or not the fimbriated ends of the tubes remain open or are closed by the infection. If they remain open the tubes may continue to discharge pus into the bottom of the pelvic cavity, known as Douglas cul-de-sac, until a large pelvic abscess develops. On the other hand, if the tubes become closed they may become distended with pus until each one forms an elongated sausage-shaped mass, known as a pyosalpinx. Sometimes a fallopian tube is seen which is distended with serous fluid instead of pus. Such a condition is spoken of as a hydrosalpinx and it was first thought to be due to a mild infection, but it seems more probable that it represents the end stage of a pyosalpinx.

The second stage of the disease often develops immediately after a menstrual period, probably due to the increased congestion occurring at that time. The organisms hitherto confined to the cervix and urethra may then extend up through the uterine cavity, to the fallopian tubes and peritoneum. With the onset of the second stage of the disease the patient develops pain in both sides of the lower abdomen, fever, increased pulse rate, a moderately high leucocytosis and marked tenderness over the lower

abdomen. Pelvic examination will then reveal tenderness in both fornices and if the fallopian tubes are sufficiently distended they may be palpable.

The first duty of the physician in charge of the patient infected with gonorrhea is to instruct her how to keep from carrying the disease to others. Sexual relations are of course prohibited. The patient is told to be particularly careful about towels and other linens that she uses so that neither she nor others will develop gonorrheal ophthalmia. Although it is believed that few if any adult women contract gonorrhea except through coitus, the patient should if possible not use toilet seats used by others or at least must carefully wash off the seat after she has used it. The danger from toilet seats is increased one thousand fold if there is a female child in the household to whom the disease may be transmitted.

It is now generally agreed that the **best treatment of acute gonorrhea,** meaning gonorrheal urethritis and endocervicitis, is with sulfanilamide and sulfathiazole. Douches and urethral instillations are often prescribed but it is doubtful if, at this stage, they are of any value. All that douches actually do is to wash away the discharge that has accumulated in the vagina from the infected cervix. They may do harm. If a Bartholin gland is infected an abscess may develop which it will be necessary to incise. The patient is advised to rest as much as possible and is strongly urged to remain in bed during the first three menstrual periods after she has been infected. By so doing she will markedly decrease her chances of developing salpingitis.

The question is sometimes asked, "Can gonorrhea in the adult woman be cured?" and the answer is *yes* provided she remains under treatment a sufficiently long time and is not reinfected during this time. It is, however, difficult to give an individual patient a definite answer as to how long it will take to cure her. This will

Fig 12 —This shows the method of expressing pus from Skene's or the para urethral ducts in a case of gonorrhea In such a case microscopic examination of a smear made from the pus will usually show gonococci (Kelly and Burnam *Diseases of the Kidneys, Ureters and Bladder* D Appleton Company )

depend on what tissues are infected and on the resistance of the patient to the disease. A physician must be very careful not to conclude that a woman has been cured of gonorrhea and is therefore not infectious until she has been under his care a considerable length of time and has been frequently examined. Three negative smears taken from the cervix and urethra at monthly intervals after treatment has been discontinued should be insisted on before a patient is discharged, and if there are any complicating conditions present, such as thickened Bartholin glands, the patient should be kept under observation for even a longer period of time. If a patient who has thickened Bartholin glands is contemplating marriage and wishes to be absolutely certain that she is noninfectious it is probably better to advise removal of the glands, even though they are causing the patient no symptoms. It must be stressed that while gonorrhea can be cured, many patients with this disease receive insufficient treatment and are discharged while they are still infectious, thus becoming themselves a source of danger to others.

The treatment of the second stage of gonorrhea, namely gonorrheal pelvic inflammatory disease, varies depending upon whether the condition is acute or chronic. Conservative treatment is indicated in acute salpingitis. At this time an operation should not be considered. The patient should be kept in bed and an ice-cap applied to the lower abdomen. Sedatives are prescribed to lessen the pain and such medicines as are necessary to assure a daily evacuation of the bowel. Vaginal douches are now strongly indicated. They lessen the patient's discomfort and help to make the pelvic inflammation subside.

In acute salpingitis and in exacerbations of chronic salpingitis both sulfanilamide and sulfathiazole have been prescribed with many brilliant results, although the percentage of cures has not been as high as in the early

cases of gonorrhea in which the disease is limited to the cervix and urethra.

It must be emphasized that sulfanilamide and sulfathiazole are not harmless drugs. There is danger associated with their use. The majority of patients taking them develop some symptoms and show certain signs. It is important for the nurse and physician to be able to discriminate between those unimportant complications which can be disregarded and those of grave significance which indicate that the use of the drug must be stopped.

Specifically, we might say that it is almost expected that a patient taking sulfanilamide or sulfathiazole will develop headaches, loss of appetite, listlessness, dizziness, shortness of breath, will tire easily, and will show a moderate amount of cyanosis. These symptoms make the patient very uncomfortable but being of no grave significance the treatment can be continued. On the other hand continuous vomiting, a marked elevation of temperature, or an extreme degree of cyanosis means that the patient cannot tolerate the prescribed drug and that if its use is continued serious consequences may follow. In practice, the degree of cyanosis is usually estimated by observing the patient's lips and fingernails and for this reason all women taking the drug should be told to stop using lipstick and nail polish.

The microscopic study of the blood is the best indicator of the patient's tolerance for sulfanilamide and sulfathiazole. A complete study should be made at least every forty-eight hours, and if large doses of these drugs are being prescribed it is probably safer to make these examinations daily. Some physicians doubt if it is ever safe to prescribe this drug to ambulatory patients but nevertheless it is often done. Such patients should be seen every day and their blood carefully watched. The fatalities that have been reported from this method of treatment have resulted from damage to the blood-forming

organs with the development of secondary anemia or a disappearance of the white blood-cells. Sodium bicarbonate is prescribed along with sulfanilamide as otherwise there is some danger of a patient developing acidosis. Sodium bicarbonate is not given to the patient who is treated with sulfathiazole.

It is important that the urine be examined frequently, preferably every day. This is especially true when sulfathiazole is used for there is some danger of hematuria and even of kidney stones developing, and the first indication of any such tendency is shown by the presence in the urine of albumin, casts, or sulfathiazole crystals. So long, however, as the urine is examined regularly, both grossly and microscopically, the danger of stone formation is so slight that it does not contraindicate the use of the drug. An occasional patient taking sulfathiazole develops a conjunctivitis, but this complication disappears as soon as the drug is discontinued.

It has been observed that most of the patients taking sulfanilamide not only develop dizziness and listlessness but they also show a certain amount of incoördination and inability to carry out work which requires delicate manipulations. This lack of coördination was not appreciated when the drug was first prescribed and was the cause of quite a few automobile accidents. Hence, it is important that patients taking this drug should not drive their automobiles. Also they should be instructed to expose themselves to very little sunlight, for numerous cases of sulfanilamide dermatitis have developed in patients who have sunned themselves on the various beaches.

There are other methods of treating gonorrhea which in some instances are very effective. All might be considered as a part of physical therapy and are based on the fact that gonococci are instantly destroyed by a temperature of 113°F. (45°C.), or at 104°F. (40°C.) prolonged for six to eight hours. These measures have as
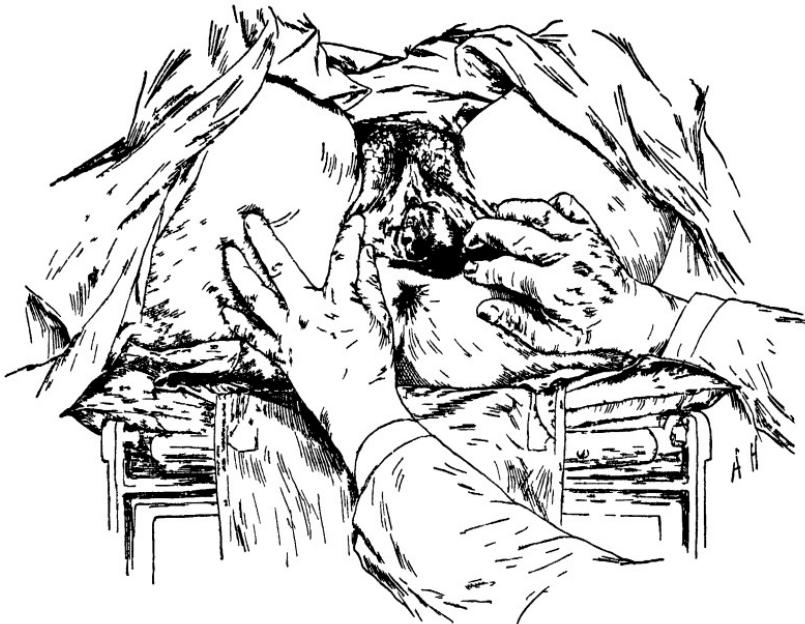
Fig 13 —Abscess of Bartholin's gland. Almost all abscesses of Bartholin's glands are due to gonorrhea The treatment in such a case is free incision and drainage (Kelly, Howard A *Medical Gynecology* D. Appleton Company.)

their object the raising of the local temperature of infected tissues to this point or if possible the general body temperature of the patient.

In the Elliott treatments a special coil is inserted into the vagina and the temperature of the water going through this coil is gradually raised. Diathermy raises the temperature of the affected part in a different way. An electric current is made to pass through the pelvis by placing one electrode in the vagina or rectum and another under the patient's back.

When the temperature of the patient's body is to be raised this is sometimes accomplished by placing all of the patient except her head in a hotbox or chamber and gradually raising the temperature. Some authorities, however, prefer to produce hyperpyrexia in patients by

injecting hypodermically foreign proteins, such as milk, or by inoculating the patient with malaria.

All these methods of treating gonorrhea have, as has already been said, produced some brilliant temporary results, but the part which they are to occupy in the future in gynecological therapy has not yet been decided. They are not unassociated with danger and should only be carried out by those thoroughly trained in physical therapy. They certainly make the patient more comfortable but, just as with sulfanilamide, the question remains unanswered whether they lessen the number of patients with salpingitis who eventually have to be operated on.

A fair percentage of women with acute salpingitis improve to such an extent under conservative treatment that an operation never becomes necessary. However, in many patients the infection becomes chronic and surgery must be advised. An operation on these women means the removal of some or all of the internal organs of reproduction. Usually both fallopian tubes must be removed although occasionally one can be saved. Not infrequently both ovaries and the uterus are so involved in the inflammatory condition that they must be sacrificed along with the fallopian tubes. This gives some idea of the ravages of gonorrhea in the adult woman, but it does not complete the picture for, in addition to causing the lesions of the external and internal reproductive organs just described, the gonococci are at times carried by the blood stream to one or more joints and there set up an arthritis, which may so cripple the patient that she will remain an invalid for the rest of her life. Once in a great while gonococci lodge in the lining of the heart and cause an infection which usually results in death. It is indeed fortunate that gonorrheal endocarditis occurs only rarely.

**The gonococcus is still responsible for a large percentage of the blindness in the world,** although the incidence of gonorrheal infection of the eye, the so-called

ophthalmia neonatorum, has been markedly decreased since it has become the law in many states that one drop of 1 per cent silver nitrate must be instilled into the eyes of every newborn infant. No matter who the parents of the child are or how confident the attending physician may be that neither of them has ever contracted any venereal disease there is never any excuse for failing to carry out this prophylactic measure.

One other aspect of gonorrhea in the adult woman must be stressed, namely, its relation to sterility. The gonococcus is responsible for about 20 to 40 per cent of childless marriages. It causes an occlusion of the openings in the fallopian tubes and thus prevents the spermatozoa or male elements from impregnating the ova or eggs. Gonorrhea not only causes childless marriages but just as frequently is responsible for the so-called one-child sterility. A woman with gonorrhea sometimes conceives and goes through her first pregnancy without any difficulty but then in the puerperium a low-grade gonorrheal infection which may have been present for a long time in the urethra and cervix may extend upward and close off the fallopian tubes, thus making it impossible for conception to occur again.

**Gonorrhea in children.**—The same organism is responsible for the infection in children as in adults, but the manifestations of the disease vary considerably, depending upon the age of the patient. This is due largely to the anatomical differences between the immature and the fully developed organs of reproduction. The vagina of the adult woman has a thick, well-developed lining made up of twenty-five to forty layers of epithelium, while that of the young girl is thin, being covered with six to fourteen layers of epithelium. This explains why vaginitis is rarely seen in the adult woman, while in children the vagina is the structure that the gonococcus most frequently attacks. While the child is unfortunate in having a thin
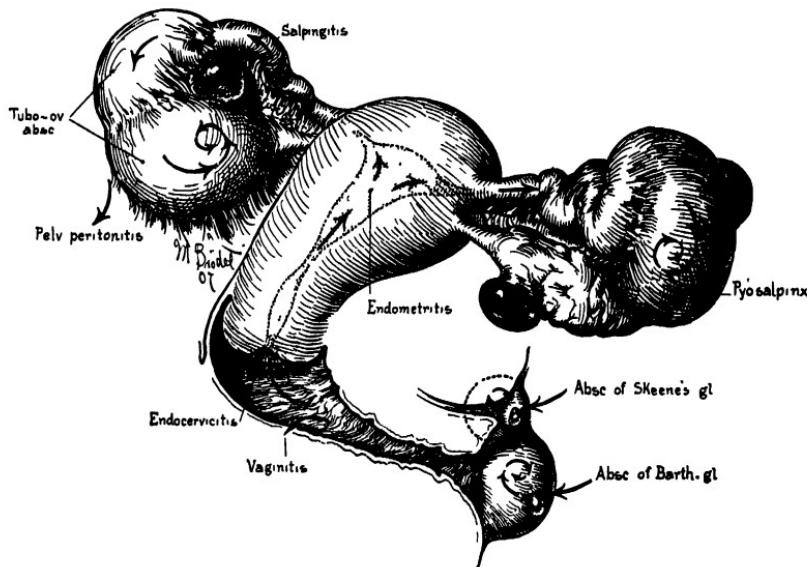
FIG. 14.—The various sites in which the gonococcus is apt to become implanted and linger. These are Skene's glands, Bartholin's glands, the vagina (in the young), the cervix, the fallopian tubes, and the ovarian follicles. The whorled arrows mark the sites in which the infection is apt to linger longest. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

vaginal lining which does not protect her against the gonococcus this disadvantage is somewhat compensated for by the fact that because the child does not menstruate she almost never develops salpingitis.

Gonorrhea is not acquired by children in the same manner as it is by adults. Occasionally one will see a little girl that has been assaulted but in the great majority of instances the disease does not result from coitus. It is contracted through the use of towels, sheets, toilet seats and other articles used by some adult having gonorrhea and then it is conveyed from one child to another like wildfire. The disease is so infectious that sometimes almost every little girl in a children's ward contracts it. Most hospitals insist on vaginal smears being examined before they will admit a child and none with positive smears are allowed

to enter, except in the gravest emergencies. Every case of gonorrheal vaginitis should be strictly isolated. These little girls should not be allowed to go to school or to use any toilet that might be used later by another child.

The older method of treating gonorrheal vaginitis in children was to instill antiseptics into the vagina and even today this method is used in some of the dispensaries. Incidentally, the most satisfactory way to give vaginal instillations to a child is to place her in the knee-chest position. A newer and very much more effective way of treatment is through estrogenic substances, given either hypodermically or by vaginal suppositories, to change the epithelial lining of the child's vagina to that of the adult woman's and thereby build up such a protective vaginal lining that the infection can be overcome.

Gonorrheal vaginitis, unless treated, may persist for many years but fortunately it does usually clear up when the child reaches puberty. That this is so and also that the internal organs of reproduction are rarely involved in children should be told to the parents of the little girls afflicted with this disease as this knowledge may bring comfort and encouragement.

### TUBERCULOUS PELVIC INFLAMMATORY DISEASE

One out of every thirteen fallopian tubes removed because of disease is found on microscopic study to be tuberculous. Wherever it occurs tuberculosis is of course due to the tubercle bacillus, an organism which produces a characteristic type of inflammation. Grossly tuberculous pelvic inflammatory disease can usually be differentiated from other types of pelvic infections by the presence of little glistening tubercles scattered like grains of salt over the pelvic organs. Often accompanying, or rather following, such a type of salpingitis there is tuberculous involvement of the entire peritoneum and then hundreds of these little tubercles can be seen scattered over the

intestines and abdominal wall. When this occurs there is usually a large amount of free fluid in the peritoneal cavity and the loops of intestine are apt to become adherent to one another.

At operation the diagnosis of tuberculous salpingitis can usually be made at a glance, but occasionally the true nature of the infection is not recognized until the tissues are examined microscopically. Just as in gonorrheal so in tuberculous pelvic inflammatory disease the fallopian tubes are the organs most often infected. In tuberculous pelvic inflammatory disease both of the tubes are involved in about 99 per cent of the cases, the uterus in 70 per cent and the ovaries in 33 per cent. These figures indicate that in this disease there is at operation little opportunity for conservative surgery, that is, for saving the internal organs of reproduction. Occasionally one is justified in leaving an ovary in a young woman, but both fallopian tubes and the uterus should almost routinely be removed when a patient is operated on for tuberculous pelvic inflammatory disease.

It has been pointed out that gonorrheal pelvic infections are secondary to lesions in the urethra, cervix, and Bartholin's glands. In tuberculous pelvic inflammatory disease the conditions are different, as the lesions in the internal reproductory organs, usually the fallopian tubes, are the primary gynecological foci. One rarely sees tuberculosis of the vulva, vagina, or cervix. However, in tuberculous pelvic inflammatory disease the salpingitis, while primary in the pelvis, is almost always secondary to tuberculosis elsewhere in the body, usually the lungs or lymph glands. In a sense salpingitis is merely a local manifestation of a systemic condition. Hence, in caring for this condition treatment must be directed not only towards the local lesions but towards the entire organism. After a woman has recovered from an operation for tuberculous salpingitis she should receive the benefit of

supportive treatment, namely rest, fresh air, and ample nourishment. She should be examined periodically for several years just as is the patient with pulmonary tuberculosis.

Some patients with tuberculous salpingitis have almost no symptoms suggesting it and hence, occasionally, at operation a surgeon unexpectedly encounters the condition. Usually, however, the disease starts with lower abdominal pain, fever, leucorrheal discharge, and some gastrointestinal symptoms. Menstrual irregularities are common. They are more apt to take the form of amenorrhea than of menorrhagia as is the case in gonorrheal pelvic inflammatory disease. The patient either begins to have scanty menstrual periods or will go one or two months without menstruating at all. A fairly large percentage of these infections can be diagnosed before operation. For instance, if one sees a virgin or a woman with absolutely no symptoms or signs suggesting a gonorrheal infection and she complains of pains in the lower abdomen and is known to have pulmonary tuberculosis the diagnosis can be strongly suspected. If in addition to the pelvic tuberculous infection the patient has a generalized tuberculous peritonitis with free fluid in the peritoneal cavity the diagnosis may be easy.

The most successful method of treating tuberculous pelvic inflammatory disease is by surgery. An operation should be advised in every case in which the general condition of the patient warrants it. Most of these women have some tuberculosis of the lungs as well as of the fallopian tubes, but the pulmonary condition unless advanced or very active is not a definite contraindication to surgery, although the ultimate prognosis depends somewhat on the extent of the lung involvement. Whenever possible ether should not be used as an anesthetic on patients with tuberculous infections; ethylene, nitrous oxide, avertin, or spinal anesthetics are less apt to ag-

gravate the pulmonary lesion. The results of surgery in tuberculous pelvic inflammatory disease are surprisingly good but, as has been said, such operations must be of a radical nature, leaving as little tuberculosis in the pelvis as possible, and the patient should receive medical care over a period of several years.

It has been observed in many hospitals that even when there is no pelvic involvement women with pulmonary tuberculosis often have an exacerbation of symptoms with the onset of each menstrual period. Hemoptyses occur more frequently at this time and the temperature is apt to become elevated. However, a large percentage of women with tuberculosis stop menstruating and indeed amenorrhea sometimes may develop before the pulmonary lesion has been recognized. This has led to the erroneous idea among some lay people that if a woman stops menstruating she will go into a decline and develop tuberculosis. This is, of course, an instance of mistaking cause and effect. As a matter of fact this amenorrhea is a protective mechanism and the tuberculous women who stop menstruating are really more fortunate than those who continue to have regular periods every month.

### PUERPERAL PELVIC INFLAMMATORY DISEASE

This group includes not only the pelvic infections following full-term pregnancies but also those resulting from abortions. Indeed the infected abortions account for more than half of this group for, every day, many pregnancies are being interrupted and often the abortionists are men or women with no knowledge of surgical technique. Each year many hundreds of women die as a result of the work of the abortionist.

The streptococcus is the organism responsible for most of these infections, but occasionally the staphylococcus, gonococcus, or colon bacillus is isolated. The symptoms of puerperal infections are chills, high fever, and pains

in the lower abdomen. Sometimes the bacteria extend upward from the vagina and cervix to the body of the uterus and cause an endometritis or infection of the uterine lining. Less frequently but still fairly commonly the streptococci extend upward through the lymphatics and veins and cause an extraperitoneal pelvic cellulitis or inflammation of the loose connective tissue lying in the pelvis outside of the peritoneum. Occasionally the bacteria get into the circulation and set up a septicemia or blood-stream infection and when this occurs death usually follows, although a few women with positive blood cultures do recover.

The treatment of puerperal infections following full-term pregnancies usually is carried out by the obstetrician, but the gynecologist is frequently asked to take care of women with incomplete abortions. There is some difference of opinion as to how cases of retained placenta should be treated. Some gynecologists strongly advise against any instrumental removal of the retained gestation products, especially if the patient has an elevation of temperature indicating the presence of infection. Others, including the senior author, feel that if there is a large amount of retained placenta it is a safe procedure to remove this either with a finger or a placental forcep but that, unless the bleeding is too profuse, it is better to delay this procedure until there has been no elevation of temperature for forty-eight hours. Practically all authorities agree that one should never curette an incomplete recent abortion.

In the treatment of puerperal infections in which the women are running high elevations of temperature and are having frequent chills there is no more life-saving measure than repeated small blood transfusions. The results following laparotomy in puerperal infections have been so poor that this operation is now seldom advised. How-

ever, when extraperitoneal broad-ligament abscesses develop they should be drained extraperitoneally.

Sulfanilamide has now been used in a large number of cases of puerperal infection with some very striking results. The best results have been reported when the streptococcus was the infecting organism.

In addition to the pelvic infections belonging to the three groups which we have just described, namely, the gonorrheal, tuberculous, and puerperal, one does encounter inflammatory conditions of the external and internal organs of reproduction which are due to other causes. For instance, one of the organisms that often infect the vagina is the *trichomonas vaginalis*. These infections are not venereal for rarely if ever are they contracted through sexual intercourse and not infrequently are they seen in virgins. It is not known exactly how this infection is contracted but it may be that the organisms are carried to the vagina from the rectum as they are not uncommonly found in the lower bowel. The diagnosis is made by demonstrating the trichomonas in a drop of the vaginal discharge. Many different types of treatment have been used. Most of them can be carried out in a doctor's office and they usually bring about a cure in six weeks but the patients should be examined at regular intervals for several months after the treatment has been stopped.

Another type of vaginitis which should be mentioned is that seen in elderly women, the so-called **senile vaginitis**. Usually the vulva is involved at the same time and perhaps the condition might better be called a vulvovaginitis. It develops in this manner. The natural resistance of the vagina and vulva to the ordinary bacteria which are so frequently present in these areas as to be considered normal inhabitants, is sometimes greatly lessened with the onset of the menopause and then these organisms set up a mild type of inflammation. There is

very little discharge or leucorrhea associated with this condition. The symptoms are usually dryness of the parts and itching. When the discomfort is marked considerable temporary relief can be obtained by using amniotin or some other type of vaginal suppositories containing estrogenic substances. In this way the senile changes may disappear and the resistance of the vagina and vulva to bacterial invasion is reestablished. **Yeast cells** and various types of fungi occasionally cause an acute vulvovaginitis. Patients with this type of infection are usually very uncomfortable because they have marked itching and burning of the vagina and external genitalia. Fortunately, the condition usually clears up in about one week when the infected parts are painted daily with a 1 per cent solution of gentian violet.

The **infections of the endocervix** have already been mentioned in the discussion of gonorrhea, for the cervix is one of the sites that the gonococcus often involves. Then too it has been pointed out that puerperal pelvic inflammatory disease often results from organisms such as the streptococcus entering the cervix at the time of childbirth and then later extending upward to involve the fallopian tubes. Now we would emphasize that there are other infections of the cervix that do not come under either of these classes. They may be due to the streptococcus, staphylococcus, or other organisms, but no matter which type of bacteria is responsible, all types of endocervicitis produce primarily the same symptom—leucorrhea. The condition is treated by local application of antiseptics and by the cauterization of the cervix. Vaginal douches make the patient more comfortable but they are not curative. The douche merely washes away the material that has dropped from the cervix into the vagina.

When **endocervicitis** is chronic it is in our opinion best treated by a cauterization of the cervix. This need not

be done in a hospital or under an anesthetic, except when there are deep lacerations or marked eversion of the mucosa. When cauterizations are carried out in the office it is often better to cauterize only part of the cervix at one time, taking two to three visits to complete the procedure. In cauterizing the cervix it is well to follow the technique suggested by Guy L. Hunner thirty-three years ago, namely, making radial strokes in the cervical tissue so as to leave some good tissue between the strokes and thus prevent cervical stenosis. The senior author prefers using a small nasal cautery to a larger cautery which destroys more tissue.

The time in the menstrual cycle at which a cauterization is carried out is of importance. It should be done either halfway between periods or, even better, just after a menstrual period; never immediately before a period. There is normally some hyperemia of the cervix with the onset of a menstrual period and if the tissue is traumatized at that time by an operative procedure such as a cauterization, any organisms, particularly streptococci, which happen to be present may be carried through the lymphatics to the broad ligaments and peritoneum or may even get into the blood stream causing a septicemia. We get into the habit of considering a cauterization of the cervix as a very simple procedure unaccompanied by any danger and for the most part this is true but once in a great while serious results have followed.

The treatment of **syphilis** does not come in the province of the gynecologist but it is an important duty of the woman specialist to recognize syphilitic lesions when he sees them. The primary syphilitic lesion is called a hard chancre and when typical it appears as a round or oval superficial abrasion surrounded by an indurated or hard base. The exudate coming from the chancre is clear, not cloudy or purulent, and the lesion is almost painless. However, atypical primary syphilitic lesions occur fre-

quently enough to make the careful physician feel that he must prove that any indolent, painless lesion on the vulva is not syphilitic. It is not uncommon to see in women several chancres, while in men one rarely sees more than a single primary syphilitic lesion.

It must be emphasized that the only reliable method of diagnosing early syphilis is by the so-called dark-field examination of the exudate from the chancre. The Wassermann blood reaction usually does not become positive until the secondary stage of syphilis has been reached, usually from four to eight weeks after the first appearance of the chancre. There are many varieties of secondary syphilitic lesions but the condylomata lata occurring on the vulva are the ones with which the gynecologist is most apt to be concerned. He must differentiate the syphilitic condylomata lata which form rather large, round, plateau-like elevations from the condylomata acuminata which are smaller, pointed, appear in clusters, and are not due to syphilis. Tertiary or late syphilitic lesions are seldom seen on the vulva. When they do occur in this area they occasionally form lesions known as gummata, which may break down and produce a fistula between the bladder and vagina or between the vagina and rectum.

Diabetes mellitus, the systemic condition due primarily to disturbed function of the pancreas, not uncommonly causes an inflammation of the vulva which produces pruritus or itching. Hence, the physician and nurse must always think of the possibility of diabetes when a woman complains of severe perineal itching. Sometimes this pruritus is the first symptom of the disease and through it the diagnosis is made. The symptoms of *diabetic vulvitis* disappear when the patient's urine becomes sugar-free but until this can be accomplished the use of sodium bicarbonate vaginal douches and irrigations of the vulva will give the patient considerable relief.

**Pediculus pubis** or crab-louse is a parasite not uncommonly found on women of the lowest class, especially prostitutes, and when such a woman uses a toilet and some of these parasites happen to fall on the seat, the next person using such a toilet may be infected. There is much more likelihood of an adult woman acquiring this disease in this way than of her so contracting gonorrhea or syphilis. The crab-louse sets up an inflammation which causes intense itching and which gives the skin of the vulva a bluish stain. On examination the parasites can be seen clinging to the pubic hair. Fortunately they can be gotten rid of fairly easily and quickly. Often merely shaving the pubic and vulval hair and washing the parts several times with green soap will entirely clear up the condition. However, in order to be certain that all the parasites have been destroyed, a mild ointment of ammoniated mercury (5 per cent) is applied twice a day.

There are two more conditions which should be considered before this chapter on gynecological infections is concluded. They are apt to be confused with each other because both are venereal diseases producing large ulcerative lesions of the vulva and perineum and because they have somewhat similar names. The first, **granuloma inguinale,** is primarily a disease of the skin and subcutaneous tissue, while the second, **lymphogranuloma inguinale,** is, as its name implies, characterized by its spread through the lymphatics.

Fortunately for white women granuloma inguinale is seen almost exclusively in the colored race. There is a primary lesion occurring either on the vagina or vulva just as there is in syphilis, but this primary lesion persists for such a short time that it is seldom seen. When the characteristic ulcers develop they often extend from the vulva to the anus and even involve the inner sides of the thighs and the groin. As the disease progresses there is marked hypertrophy of the tissues surrounding the

ulcers. Probably the disease is due to some large cells containing structures known as Donovan bodies. These bodies can be found in the tissues when they are stained and examined microscopically.

Lymphogranuloma inguinale is also called lymphogranuloma venereum. In contrast to granuloma inguinale it is seen with almost equal frequency in the two races. It has a primary lesion of the vulva just as does granuloma inguinale but as it extends by the lymphatics rather than by the subcutaneous tissue it is the more destructive of the two diseases and often causes fistulae and destroys large masses of tissue. In several cases the senior author has seen the entire urethra destroyed. When the condition extends towards the rectum, as it often does, it causes a stricture of the rectum. In fact lymphogranuloma inguinale is the commonest cause of rectal stricture in women. The disease is due to a filterable virus, the exact nature of which little is known. Many drugs have been used in the treatment of this very serious condition, but in the past none have proved of any value. It is hoped that sulfanilamide, sulfapyradine or sulfathiazole, all of which are now being tried, may prove efficacious. So far there have been conflicting reports as to the value of these drugs in the treatment of lymphogranuloma inguinale.

CHAPTER VI

UTERINE DISPLACEMENTS AND
OBSTETRICAL INJURIES

As has been brought out in the chapter devoted to
anatomy, the normal position of the womb is forward
with the cervix meeting the body of the uterus at an angle
of about 120°. With the patient in the upright position
the external os of the cervix usually lies at about the level
of the symphysis pubis. There are numerous conditions
which may cause the uterus to be in other than the normal
position just outlined and these malpositions are of
several different types. Only those types most commonly
encountered by the gynecologist will be discussed.

It is well before beginning a discussion of malposition
of the uterus to stress one point in the consideration of
this subject. Women vary markedly in the amount of dis-
comfort they experience through having the womb in
other than its normal position. For instance, some of the
women whose uteri lie backward in the pelvis are not
aware of it and suffer no discomfort, while other women
with the same degree of malposition may be completely
disabled. Hence, it is important to take into consideration
the patient's history as well as the findings on physical
examination before deciding whether or not the patient
who has a malposition should have the condition cor-
rected surgically.
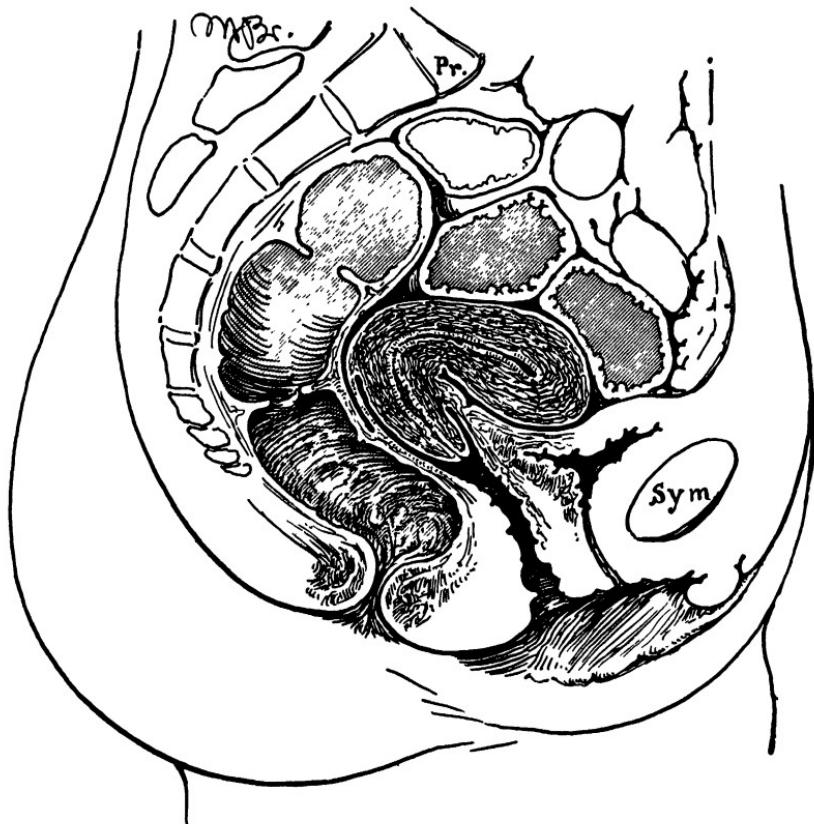
Fig. 15.—Acute anteflexion of the uterus. Compare the position of the uterus in this drawing with that in figure 4, which shows the uterus as it is normally. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

**Acute anteflexion** means that the body of the uterus is bent on the cervix so as to form an acute angle. This condition is often found in young women and is a common cause of severe pain with the menstrual periods. It is sometimes corrected by pregnancy. If there is severe dysmenorrhea due to acute anteflexion of the uterus a thorough dilatation of the cervix with uterine dilators usually relieves the discomfort. Some gynecologists sew stem pessaries into the cervix in an attempt to straighten out the acute angle between the cervix and body of the uterus.

Pessaries used for this condition are introduced into the uterine cavity and remain there over a period of several months. Because of this they sometimes set up an infection of the cervix and, therefore, many gynecologists, including the senior author, have almost entirely discontinued using stem pessaries.

**Retroposition of the uterus.**—In 20 per cent of all women the womb lies back in the pelvis but only half of this number experience any discomfort because of it. *Retroflection of the uterus* is usually considered a subdivision of this condition in which, in addition to the uterus being back in the pelvis, the uterine body is bent backward on the cervix. The symptoms of retroposition and retroflexion are essentially the same so they may be considered together. They include dysmenorrhea, back-ache, and sometimes sterility although many women with retroposition of the uterus do conceive. If a woman is suffering because of retroposition of the uterus the best method of treating her is by operation. There have been numerous operations devised to correct retroposition of the uterus, but the particular one used most frequently, at least in the Baltimore hospitals, is the so-called modified Gilliam operation, which consists in holding the uterus forward by shortening the round ligaments. When an operation is contraindicated or is refused, pessaries may be used to keep the uterus forward. Pessaries used to correct retroposition are not introduced into the cervical canal as are the stem pessaries used for acute anteflexion. They are merely introduced into the vagina and, hence, there is very little danger associated with their use.

Fifty years ago many different types of pessaries were used to correct retroposition. In fact almost every gynecologist of note devised some type of pessary which was a little different from those used by his competitors, and
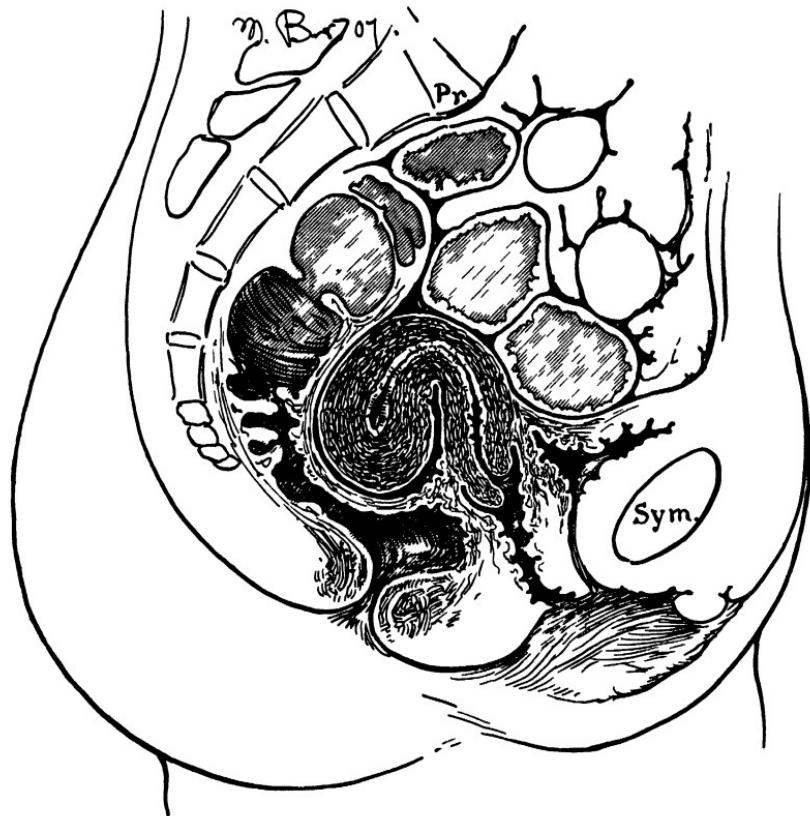
FIG. 16.—Uterus in retroposition and acute retroflexion A patient with her womb in this position is apt to suffer with dysmenorrhea, backache, and constipation. Both retroposition and retroflexion are common causes of steril ity. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

named his pessary after himself. Today the Smith and the Hodge pessaries are the only ones enjoying any popularity and even their use has been greatly restricted. For it is realized that a pessary gives relief to a woman with retroposition of the uterus only so long as she wears it. Moreover, while a woman is wearing a pessary she must take frequent vaginal douches and should have the pessary removed at least once every two months and thoroughly cleaned before it is reinserted. Otherwise infection
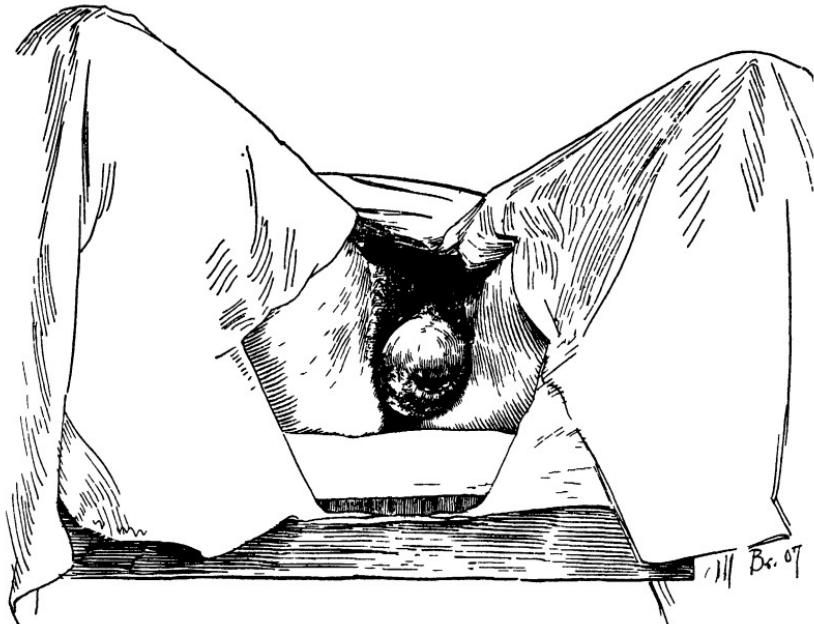
FIG. 17.—Complete prolapse of the uterus. Considerable edema has developed in the protruding parts. The vagina with the cervix hangs like a bag between the patient's thighs. The cervix usually becomes ulcerated. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

and ulceration of the vagina are apt to occur. It is, therefore, quite natural that most women soon tire of wearing pessaries and prefer to be operated on, and thus to have the condition permanently cured. One thing that should be impressed on every nurse is how to sterilize pessaries and how not to. *Do not boil pessaries.* If they are boiled they lose their shape and become circular. They should be sterilized by soaking them for twenty minutes in either alcohol or bichloride of mercury 1-1000.

**Descensus uteri** is the descriptive term for a uterus fallen below the normal level. It is also called prolapsus uteri and procidentia uteri. There are various degrees of this condition up to the complete prolapse in which the entire uterus comes out of the vagina and hangs down

FIG. 18.—This uterus was moderately prolapsed but it has been put back in normal position and is being held there by a ring pessary. In cases of complete prolapse pessaries seldom work entirely satisfactorily but they must be used when an operation is contraindicated. (Kelly, Howard A. *Medical Gynecology*. D Appleton Company.)

between the patient's thighs. The condition is almost always due to injury at childbirth. With the dropping of the uterus one usually finds the evidence of other obstetrical injuries, such as laceration of the cervix, a cystocele, or rectocele. In fact the cystocele and rectocele usually precede the development of the uterine prolapse and often a woman who has been only moderately injured

at childbirth will have a lacerated cervix, cystocele, and rectocele without any marked prolapse of the uterus.

With almost every delivery some tearing of the cervix occurs and, unless this laceration is immediately repaired by the obstetrician, some eversion of the cervical mucous membrane will later appear at the site of the tear. This eversion of the mucous membrane, along with the infection which so often develops in the lacerated parts, is apt to cause a leucorrheal discharge which may worry the patient long after the puerperium is over. Hence, the careful inspection of the cervix with a bivalve speculum is an important part of every pelvic examination. If the laceration is a very superficial one and is giving the patient no symptoms it may be ignored, but if there is infection and marked eversion it should be treated. Some of the less extensive lacerations can be successfully treated by a cauterization carried out by a doctor in his office. The deeper lacerations and those accompanied by marked infection should be corrected by a plastic operation performed on the cervix. A plastic operation on the cervix is called a trachelorrhaphy or a tracheloplasty. In performing this operation a gynecologist removes the infected edges of the torn cervix and then reunites healthy tissue, restoring the cervix, as far as possible, to its original contour. This operation should not be confused with an amputation of the cervix in which a large part of the cervix is removed. The latter operation, namely the amputation of the cervix, should never be performed on a woman in the childbearing age for if she becomes pregnant she will either abort or, if she carries the child to term, will probably have a very difficult labor.

A **cystocele** is the prolapse of the urinary bladder into the vagina. It is due to injury of the pubocervical ligaments and is really a hernia. Like all childbirth injuries, if it gives symptoms, or if it is very marked without giving symptoms, the condition should be corrected by plastic

surgery. The name of the particular operation carried out for cystocele is an *anterior colporrhaphy.*

A **rectocele** is a prolapse of the lower part of the rectum into the vagina. It is due to injury of the perineal muscles, especially the levator ani. It also is a form of hernia and is corrected by the operation known as *posterior colporrhaphy* or *perineorrhaphy.*

Even when there is a complete *prolapse* of the uterus, as well as a lacerated cervix, cystocele, and rectocele, the operative procedures by which, at one time, all these conditions are corrected can be carried out with very little shock to the patient. These operations are usually performed through the vagina and if a woman has a complete prolapse and is in good physical condition it is safe to operate on her even if she is sixty-five years of age.

However, even if the surgical correction of complete prolapse meant considerable risk of life most of these patients would gladly submit to an operation. For their condition is pitiful even though they may live just as long with the womb hanging down between the thighs as they would if it were up in proper position. Most of them have backache and a bearing-down sensation in the lower abdomen. Not infrequently large ulcerations develop on the prolapsed vaginal walls from friction of the tissue against the patient's thighs and underclothing. Usually leucorrhea is complained of and often there is a little bleeding. Partial urinary incontinence is not uncommon and when the patient sneezes or coughs she may wet herself. One might expect that a large number of the vaginal ulcers would become malignant but strangely enough cancer is very seldom seen in prolapsed uteri. Never· theless, as has been said, most women with this condition welcome a surgical procedure which is almost certain to relieve them of their symptoms and permit them to lead more active and happier lives.

Occasionally, however, an operation is contraindicated

because of grave medical conditions and then ring pessaries are tried. They are seldom entirely satisfactory but sometimes they do give the patient considerable relief. Some of these ring pessaries are made of hard, others of soft, rubber. They must be removed at frequent intervals and cleaned before being reinserted into the vagina. It is difficult to fit a patient with a ring pessary of exactly the right size but it is very important to do so. If too small a one is used it will slide out of the vagina; too large a one will cause the patient discomfort.

There are three other types of obstetrical injuries which should be mentioned. These are vesicovaginal fistula, complete perineal tear, and inversion of the uterus. A **vesicovaginal fistula** is an opening between the bladder and the vagina and a woman with such a condition has urinary incontinence. Because of improved obstetrical care one now sees very few vesicovaginal fistulae, but formerly there were thousands of women afflicted with this frightful condition. It is to the credit of this country that the first surgeon to devise a method of correcting vesicovaginal fistula was an American named Marion Sims. Before Sims perfected his technique, many hundreds of surgeons had operated on patients with this condition but the operations were almost always unsuccessful and these unfortunate women were forced to go through life constantly dribbling urine. The account of the difficulties this great American surgeon encountered before he finally succeeded in curing a patient with a vesicovaginal fistula is interestingly told in his autobiography which was published in 1894 under the title of ''The Story of My life.''

Copies of this little book can be obtained from medical libraries and all those who read it, whether they are nurses or medical students, will find it both interesting and stimulating. The author relates how for four years he
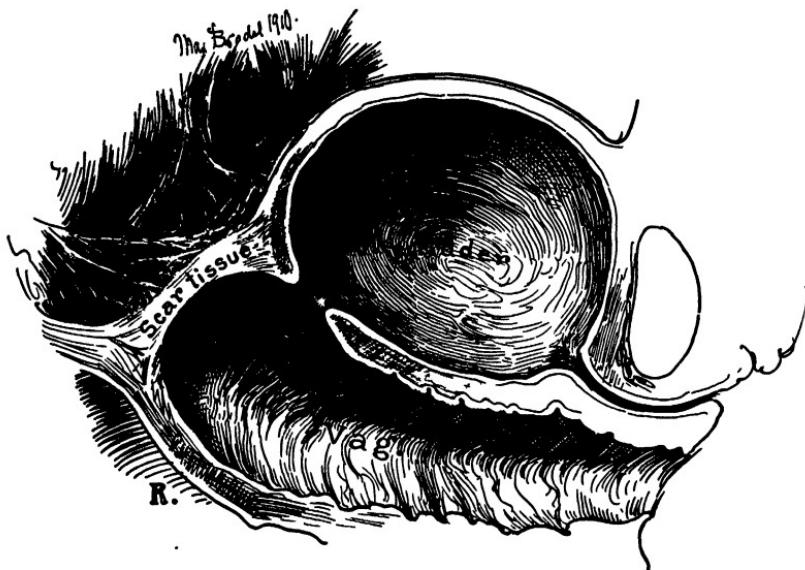
Fig. 19.—A vesicovaginal fistula. In this case the fistula developed as a result of injury to the bladder during the operative removal of the uterus. Formerly most of the fistulae seen were due to difficult labor and poor obstetrics. Fortunately today only a small number develop in this manner, but occasional cases are still seen which have resulted from injury to the bladder during an operation. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder.* D. Appleton Company.)

studied and operated on colored slaves with vesicovaginal fistulae, feeding, clothing, and housing these unfortunate women all this time at his own expense. At first he was helped in the operations by fellow physicians, but as failure followed failure they gradually lost interest in his work. Finally, he trained his patients to be his assistants. All this time he was perfecting his operative technique and developing new operative principles. In May 1849 he operated for the thirteenth time on a young slave named Anarcha, using, for the first time in the history of surgery, silver wire as a suture material, and cured the vesicovaginal fistula. The two negro women, Lucy and Betsy, who assisted at Anarcha's operation

were in turn operated on successfully during the two weeks that followed.

Since Marion Sims's time the operative correction of vesicovaginal fistula has been still further improved, but this in no way lessens the credit due to the man who was the first successfully to treat this condition. More-over, even today many gynecologists use many of the principles emphasized by Sims and in difficult cases silver wire is still sometimes used as suture material.

When a surgeon thinks that he has inserted as many sutures as are necessary and that he has probably cured the fistula, it is a wise precaution to fill the bladder with either a solution of sterile milk or methylene blue and observe whether or not there is any leakage into the vagina. Hence, it is well for the nurse in the operating room to have these solutions ready when such an opera-tion is to be performed  The senior author prefers using a solution of sterile milk as it does not stain the tissues, but methylene blue is more generally used.

A **complete tear** means that the entire perineal body is torn through from the vagina to the rectum. The levator ani and sphincter ani muscles are divided, thus leaving the unfortunate patient with fecal incontinence. In spite of the great improvements that have been made in ob-stetrical care in the past decade, the gynecologist still sees every year at least a few women with this distressing condition. The treatment of a complete perineal tear is of course surgical and the important steps in the operation are the reuniting of the torn ends of the levator and sphincter ani muscles. Fortunately, the technique of this operation has been now so thoroughly worked out that it is almost always successful.

**Inversion of the uterus** is rarely seen. When it is it usually is the result of poor obstetrics but occasionally it is brought about by the constant traction on the uterus
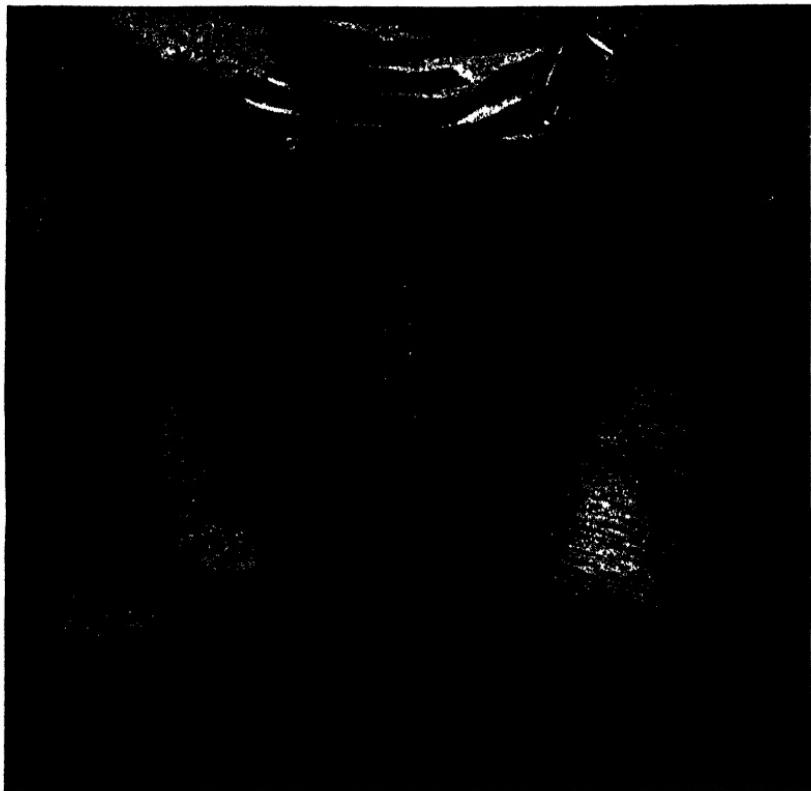
Fig. 20.—A complete perineal tear from the vagina to the anus. Both the levator ani and sphincter ani muscles have been torn through. There is no sphincter muscle over the anterior half of the anus. The ends of the torn sphincter ani muscles appear as little pits. The patient has fecal incontinence. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

of a large pedunculated submucous fibroid tumor. What actually happens, in most instances, is that a physician or midwife either pushes too forcibly from above on the lower abdomen in an effort to express the afterbirth or pulls on the umbilical cord from below.

In inversion of the uterus the womb is turned inside out just as a glove might be. Sometimes the inversion is complete and sometimes partial. With this condition the patient is apt to become desperately ill and go into a

condition of shock. In fact, the mortality associated with inversion of the uterus is quite high.

Sometimes it is possible to correct the inversion by gentle manipulation and this may be ʋried. However, if the patient's condition is serious it is better merely to pack gauze against the inverted uterus to lessen the bleeding and treat the patient for shock, ignoring the inverted uterus until the patient's condition improves. In many instances manipulation fails to correct the inversion and either an abdominal or vaginal operation is necessary.

CHAPTER VII

# ECTOPIC OR EXTRAUTERINE PREGNANCY

These two terms are not quite synonymous but for all practical purposes they can be considered as being so. Normally the ovum or egg is fertilized by the male element or spermatozoon near the distal end of the fallopian tube; the fertilized ovum then travels down the tube to the uterus and there sinks into the endometrium or lining of the uterus, and develops into a full-term baby. However, if anything interferes with the downward progress of the fertilized ovum through the fallopian tube the egg then digs its way into the lining of the tube and a tubal or extrauterine pregnancy develops. Because the tube is not equipped by nature to take care of the growing fetus, one of two things usually happens. Either the fetus breaks into the cavity of the tube and what is called a tubal abortion occurs, or it digs its way through the outer wall of the tube and breaks into the peritoneal cavity. This is a tubal rupture. When it occurs large vessels in the tubal wall are torn through and there is profuse bleeding into the peritoneal cavity. In a tubal abortion there is bleeding into the lumen of the tube and out through the fimbriated end into the peritoneal cavity, but the internal hemorrhage and consequently the signs of shock are usually not so great in tubal abortion as in tubal rupture.

Fifty years ago it was thought that ectopic gestation

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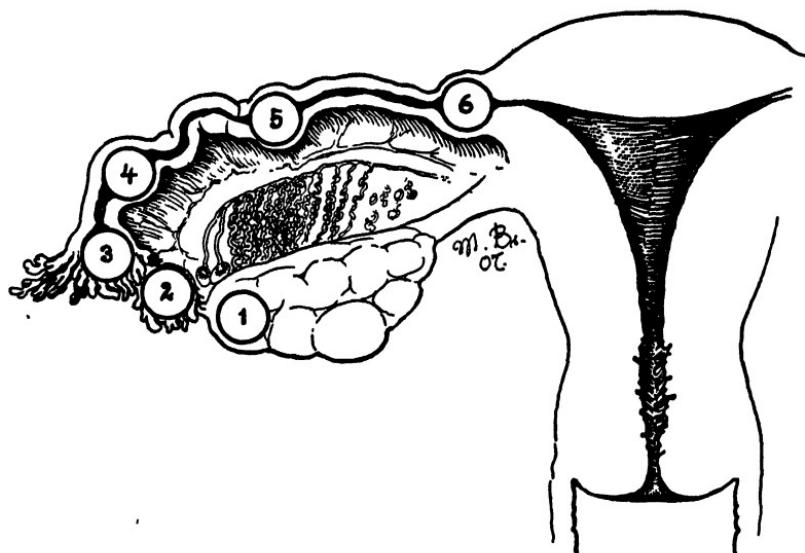
FIG. 21.—Various sites of implantation of the ovum in extrauterine pregnancy: (1) ovarian pregnancy; (2) implantation upon the tubo-ovarian fimbriae· (3) implantation within the fimbriated extremity of the uterine tube; (4) attachment of the ovum in the ampulla; (5) isthmial attachment; (6) interstitial implantation. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

was a rare condition, but it has now been shown that **out of every three hundred women who become pregnant one will have the pregnancy in a fallopian tube.** There are at least twelve cases every year on the gynecological service of the Johns Hopkins Hospital. This demonstrates how important a subject is ectopic pregnancy.

Many factors may interfere with the passage of the fertilized ovum from the graafian follicle to the uterus, or cause it to become embedded elsewhere than in the uterine cavity and so produce an ectopic pregnancy. However, while we may be able to prove in one instance that a certain factor was responsible for the tubal gestation and in another instance that there was a different cause, there still remain quite a large number of cases in which the etiology is unsolved.
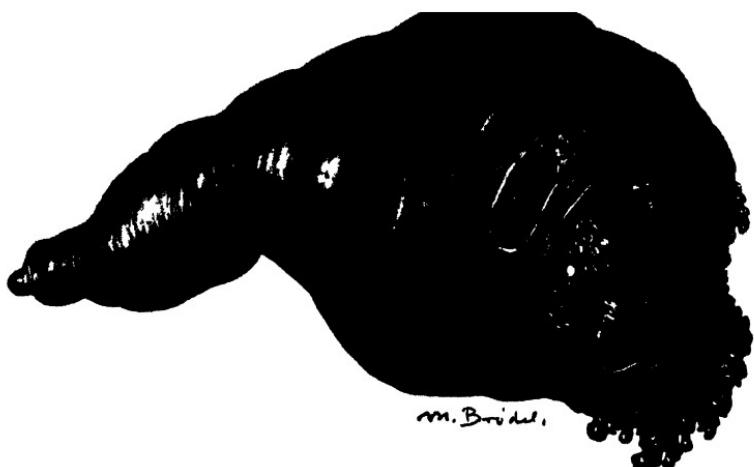
FIG. 22.—Extrauterine pregnancy terminating in a tubal abortion. As the fetus has detached itself from the wall of the tube bleeding has occurred into the lumen of the tube. Clots of blood can be seen protruding from the distended fimbriated end of the tube. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

The factors responsible for tubal pregnancy fall into two groups:

1. Abnormalities within the lumen of the fallopian tubes which cause obstruction to the passage of the ovum.
2. Factors outside of the fallopian tubes which by pressure or kinking of the tubal lumen obstruct the passage of the ovum.

The greatest number of tubal pregnancies are now believed to be caused by abnormalities within the tubes themselves. In the majority of cases, they are the result of a previous salpingitis which has glued together the folds of the tube so as to form canals which, while opening into the main lumen of the tube at one extremity, terminate blindly at the other. It is in these blind endings that in many cases the progress of the fertilized ovum is

stopped and a tubal pregnancy develops. Then too strictures of the main tubal lumen, due to the gluing together of the mucous membranes by inflammatory processes, may interfere with the ovum's progress to such an extent that it finally settles down and embeds itself in the tubal wall to form an ectopic pregnancy. Gonorrhea is probably responsible for more cases of tubal pregnancy than are the streptococcic infections of the puerperium, for when the latter do not end fatally, complete resolution is the rule; whereas the gonorrheal infections leave the tubes bound down by adhesions externally and internally with the folds adherent to one another. Tuberculous salpingitis is a negligible factor.

Among conditions which cause tubal pregnancy by pressure on or kinking of the tubal lumen, the most common is adhesions around the tube, the result of an old pelvic inflammatory disease. Usually these are due to a former gonorrheal infection, although occasionally they result from an old ruptured appendix.

Occasionally uterine, ovarian, and parovarian tumors press on a fallopian tube. In one of the senior author's cases he was able to show that the further course of the ovum was stopped by a parovarian cyst which pressed on the fallopian tube in such a way as to twist it sharply and shut off its lumen. Figure 23 shows the condition at operation.

Much has been written about the likelihood of a woman who has had a tubal pregnancy on one side in later years developing a gestation in the other tube and for this reason some gynecologists have advocated a double or bilateral salpingectomy in every case of ectopic pregnancy. Such a procedure seems very radical, especially in the cases of women who have no children. Even though it is true that a woman who has had a tubal pregnancy has a greater chance of having another than the woman who has never had an ectopic gestation, still the percentage
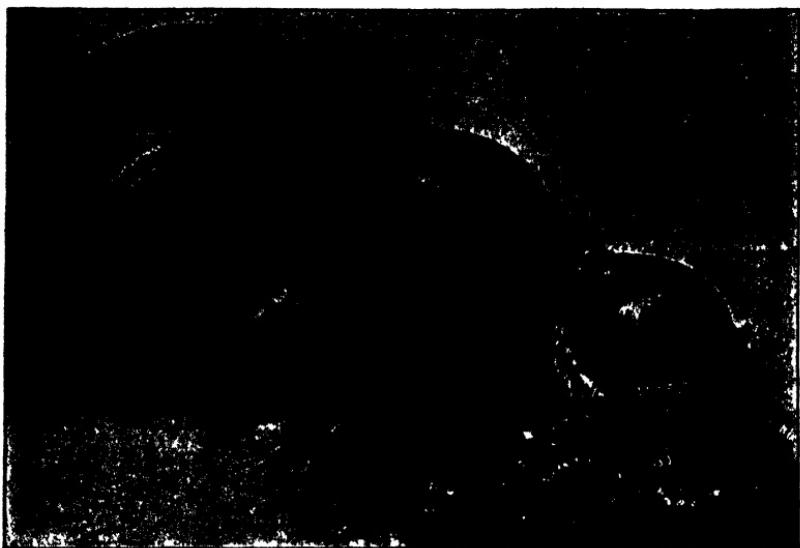
Fig. 23.—Extrauterine pregnancy terminating in rupture of the fallopian tube. The picture shows a parovarian cyst on the right which has kinked the fallopian tube immediately distal to the site of the rupture. On the left there is a larger parovarian cyst. When the pregnancy ruptured the patient bled into her own peritoneal cavity. In the picture can be seen some of the blood clots found in the peritoneal cavity and the fetus which was lying free in the clotted blood. The smaller drawing in the upper right-hand quadrant indicates the mechanism by which the right tube was compressed by the parovarian cyst (Brady's case).

of repeated tubal pregnancies is not high and a woman is much more likely, after a tubal gestation, to have a normal pregnancy than to repeat what she did the first time. The senior author has several patients who, after having one tube removed for ectopic pregnancy, have had several intrauterine pregnancies and borne normal children.

Ectopic pregnancies may occur in any part of the tube and are spoken of as interstitial, isthmial, or ampullar, depending upon the site of implantation of the ovum. In an interstitial pregnancy the gestation sac is in the wall of that part of the tube that traverses the uterine wall and ends in the uterine cavity. Fortunately, this is the

rarest form of tubal pregnancy for often it produces no symptoms until the tube ruptures, but when this happens profuse intraperitoneal bleeding occurs and not infrequently sudden exodus of the patient. The mortality in interstitial pregnancy is much higher than in any other form of tubal gestation.

**Most cases of tubal gestation terminate within the first three months of pregnancy,** either by the growing fetus digging its way through the tubal wall until it ruptures into the abdominal cavity, or by a so-called tubal abortion, in which the gestation sac breaks into the lumen of the tube instead of through the outer wall.

The **typical history of a case** of tubal pregnancy is as follows: A patient misses her menstrual period and thinks that she is normally pregnant. Her breasts contain colostrum and she experiences the usual symptoms of a normal uterine pregnancy. There may or may not be discomfort on one side of the lower abdomen due to distention of the tube by the growing ovum. Usually after the patient has missed one or two menstrual periods she starts to pass small quantities of blood every few days. When either tubal abortion or rupture occurs, the patient feels a sudden sharp pain. If the amount of blood poured into the peritoneal cavity is large, the woman shows all the signs of internal hemorrhage, namely, pallor, air hunger, rapid thready pulse, falling blood pressure and cold clammy extremities. Sometimes she faints. On the other hand, if only a small amount of internal bleeding occurs the patient may experience only a moderate amount of discomfort and may not be incapacitated. On pelvic examination one finds, in tubal gestation, a softening of the cervix such as is present in a uterine pregnancy and a tender mass is usually palpable in the region of one of the fallopian tubes. Sometimes on vaginal examination blood clots can be felt in the lower part of the peritoneal cavity.

The laboratory examination of the blood and especially the hemoglobin estimation and red blood count are apt to be confusing in early cases of tubal gestation for, even when there is a large amount of intraperitoneal bleeding, it takes about forty-eight hours before this blood loss is manifested in the laboratory studies of the blood. This may lead to confusion and cause the doctor to fail to recognize the seriousness of the patient's condition. Incidentally, the blood in the peritoneum sometimes produces pain in one or both shoulders, which is really a reflex symptom due to the blood in the peritoneum working up from the pelvis to the upper abdomen and irritating the diaphragm. When shoulder pain along with abdominal discomfort is described by a woman who has a suggestive menstrual history she probably has an ectopic pregnancy.

While it is fairly easy to make the correct diagnosis in cases of ruptured tubal pregnancy which show the signs of internal hemorrhage, it is often very difficult correctly to diagnose an unruptured tubal pregnancy and relatively few such diagnoses are made. Sometimes an obstetrician or a gynecologist is uncertain whether his patient has an intra- or extrauterine pregnancy and it may be necessary for him to examine the woman several times before he can decide this. When such is the case it is the attending doctor's duty to keep in constant touch with his patient so that if she does suddenly have an internal hemorrhage, she can be brought to a hospital promptly and receive proper attention.

The endometrium or lining of the uterus becomes thickened in a case of tubal pregnancy just as it does in a uterine pregnancy but the changes are not so marked. When the fetus in the tube begins to die the thickened lining of the uterus is thrown off. The woman will then notice that she is bleeding and perhaps will observe several small fragments of tissue in the blood. Occasionally

the entire thickened uterine lining comes away in one piece and when this occurs a woman is apt to think that she has had a miscarriage and a physician, seeing such a large piece of tissue, may be led into agreeing with the patient. However, microscopic study of the tissue will determine whether or not there has been an intrauterine pregnancy for, if there has been, parts of the fetus will be seen as well as bits of the uterine lining.

There is one sign of ectopic or tubal pregnancy that should be mentioned, not because it is often seen, but because it clinches the diagnosis of intraperitoneal hemorrhage which in women, in the great majority of cases, means that a tubal pregnancy has ruptured. This sign is called the Cullen sign and consists of the sudden development of discoloration of the umbilicus and the surrounding area. The tissue around the navel shows varying hues of color, such as are seen in a fading "black eye." This sign is due to the fact that in some individuals the abdominal wall is quite thin at the umbilicus and may become discolored by the blood in the peritoneal cavity. Once in a great while this same sign may be seen in thin spots in the abdominal wall other than the umbilicus.

The **treatment of tubal pregnancy** is surgical and, unless the patient's condition is desperate, an operation should be performed as soon as the diagnosis is made. The patient is bleeding into her own peritoneal cavity and this bleeding must be stopped. There are few operations more dramatic than those performed for ectopic pregnancy. After the skin, fascia, and muscles have been divided, the surgeon can sometimes see bluish-black blood clots filling the peritoneal cavity and when the peritoneum is incised, large quantities of blood may come pouring out.

Surgical treatment consists in the removal of the fallopian tube containing the gestation. Sometimes it is necessary to remove the ovary with the tube. If the patient's

condition is grave, because of internal hemorrhage, trans
fusions are given. When it is not possible to get a suitable
donor for a transfusion and the blood in the peritoneal
cavity is neither clotted nor infected the surgeon some-
times resorts to autotransfusion. The blood in the peri-
toneal cavity is aspirated, strained through gauze, mixed
with sodium citrate to prevent clotting, and then is in-
jected into the patient's vein. This should not be done
unless the patient's condition is very serious, as there is
some danger associated with the procedure.

The first deliberate operation for ectopic pregnancy
was performed by Lawson Tait in 1883. Seven years be-
fore that a statistical study had been made of 500 cases of
ectopic pregnancy. Three hundred and eighty-six pa-
tients died, or 76 per cent. Today in well-conducted hos-
pitals the mortality is 4 per cent. In other words, given
500 cases today, we might expect only twenty deaths.
These figures become very interesting when one remem-
bers that one of every 300 women that become pregnant
has her pregnancy in a fallopian tube.

In most cases of extrauterine pregnancy the gestation
develops in the fallopian tube, but once in a great while,
when the egg is fertilized just after leaving the ovary, it
does not enter the tube but sinks back into the ovary and
an *ovarian pregnancy* develops. Also, very infrequently,
when a tubal or ovarian pregnancy ruptures, the embryo
does not die but, with its surrounding tissue, becomes im-
planted on the intestines and peritoneum and continues to
grow, forming an abdominal pregnancy which may go on
to term. Even though abdominal pregnancies occur very
rarely, a consideration of their treatment is of sufficient
interest to warrant a brief discussion even in a book of
this size.

It was proved through a series of disastrous operations
performed for abdominal pregnancy that the operator
who, after removing the fetus, attempts to detach the

placenta, courts disaster, for women treated in this manner almost always bleed to death. The hemorrhage that results from the large vessels in the placenta is so profuse as to be almost uncontrollable. After learning this through clinical experience, the gynecologist next developed a method of treating women with abdominal pregnancy which consisted in removing the fetus, leaving the placenta attached to the intestines and peritoneum and controlling the hemorrhage by packing into the peritoneal cavity many yards of gauze. This meant for the patient a long convalescence for only very gradually does the placenta detach itself from the intestines and come away with the gauze pack. Patients so treated often had trouble later from intestinal adhesions or postoperative hernia.

Doctor A. C. Beck, by working on dogs, discovered something which completely changed the treatment of abdominal pregnancy. He had an idea that the peritoneum would completely digest the placenta if it were left in situ and he proved this to be so in the following manner: He opened the abdomens of several dogs, and then, taking placentas from women delivered by caesarean section, he dropped these placentas into the dogs peritoneal cavities. The dogs suffered no ill effects from this and when the abdomens were reopened several months later the placentas had entirely disappeared, and there were no intestinal adhesions. After this gynecologists dared in abdominal pregnancy to leave the placenta attached to the intestine, after removing the baby and to close the abdominal cavity without drainage. With this method of treatment many women with abdominal pregnancies completely recover who formerly would have succumbed. Thus, as is so often the case, experimental work carried out on dogs in the laboratory reveals facts of great therapeutic value for the sick human being.

## STERILITY

Many husbands have very erroneous ideas about sterility. A man is apt to bring his wife to a doctor's office and say, "We have been married eight years and have never had any children. Please examine my wife and tell me why we haven't." Few husbands say, "Please examine me." As a matter of fact careful studies have shown that the male is responsible for about 40 per cent of the cases of sterility.

No gynecologist is justified in performing the simplest type of operation for sterility until he is certain that the husband has active normal spermatozoa. There are several ways in which this can be determined. The husband may be referred to a specialist for men. A second method of determining whether or not the husband is normal is for the gynecologist to make a postcoitus test on the woman. This is known as the Huhner test and by it one can demonstrate not only whether the husband has normal sperm cells but also whether or not his spermatozoa are destroyed by his wife's vaginal secretion.

**The complete study of a case of sterility includes a thorough examination of both the man and woman.** Not only should a pelvic examination be made on a woman but also a general physical examination. A basal metabolism estimation occasionally shows some thyroid de-

rangement and not infrequently some general medical condition such as a marked secondary anemia will be found, either of which decreases the wife's fertility. Most often, however, the cause of the sterility is found in the pelvic organs. An endocervicitis may be the source of so much leucorrhea that it is impossible for the spermatozoa to travel up the generative tract. In some women a retro-position of the uterus seems to play a part in the sterility although, as has been said elsewhere, many women with a retroposition of the uterus do conceive.

It has been thought by a few gynecologists that abnormal acidity of the vagina may destroy spermatozoa and thus be a cause of sterility. Accordingly sodium bicarbonate douches have been prescribed and alkalies have been given by mouth. However, it is now believed that seldom is the reaction of the vagina sufficiently acid to affect the sperm and hence that there is very little likelihood of benefit from any alkaline therapy. Stenosis of the cervical canal is certainly a much more frequent cause of sterility. Not infrequently a thorough dilatation of the cervix will be followed by conception in a woman who has been sterile for years.

**Tubal occlusion** is responsible for about 40 per cent of all sterile marriages. Probably the gonococcus is more often responsible than any other organism for the sealing off of the tubes but many women, who otherwise would have been fertile, sterilize themselves by inducing an abortion the first time that they become pregnant and closing off the tubes through the streptococcus infection that so often follows such procedures. Tuberculous salpingitis is responsible for a few cases of tubal closure as is also appendicitis with peritonitis.

Rubin, a gynecologist at the Mt. Sinai Hospital in New York, devised an insufflation test by means of which the patency of the tubes could be satisfactorily and easily determined. This test consists of the introduction into the

uterus of a cannula through which gas may be forced into the uterus and out through the uterine cornua and fallopian tubes into the peritoneal cavity. Oxygen and air have been used but carbon dioxide is preferable as it is absorbed more rapidly from the peritoneal cavity. Both the pressure and volume of gas introduced into the cannula are carefully recorded.

When the **Rubin's test** was first introduced, a positive test was diagnosed largely by a series of X-rays which demonstrated the pressure of air in the upper abdomen under the diaphragm. However, Rubin and many other gynecologists who carry out this test without giving the patient any anesthetic feel that one can be certain that gas has entered the peritoneal cavity when the patient complains of discomfort in the upper abdomen or shoulder pains. Most gynecologists believe that it is not necessary to take X-rays to interpret correctly the results of this test and, as many of them give the patient an anesthetic, they can no longer rely on the patient complaining of pain in the upper abdomen. Their interpretation is based largely on the readings of manometric pressure. Ordinarily this rises in the system to a pressure of around 100 mm. of mercury and then falls to a level of 40 or 50. When there is a partial obstruction in the tubes the gas may go through at any point up to a pressure of 200 mm. but when this figure is reached the tubes are judged to be closed. Pressures higher than 200 mm. are not used because of the danger of rupturing the fallopian tubes.

It is customary to have an assistant listen with a stethoscope over the patient's lower abdomen as a Rubin's test is carried out. It is then possible to hear a high-pitched whistling sound when the gas passes out of the fallopian tubes into the peritoneal cavity. Sometimes the assistant who is listening will feel quite confident that the gas is coming through one side and not through the other
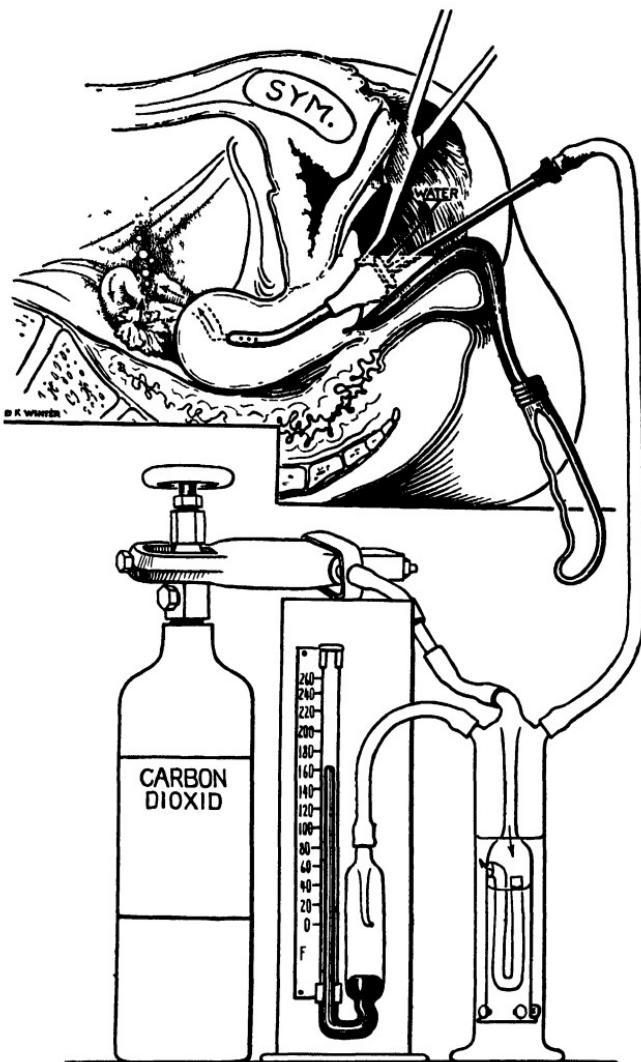
FIG. 24.—A Rubin's Test. A Sims speculum has been introduced into the
vagina. A cannula is held within the uterus and bubbles of gas are shown
passing from the distal ends of the fallopian tubes. The outer end of the
cannula is connected with a cylinder of gas and with a manometer which
measures the pressure of the gas in the system. As in this instance the gas is
seen passing from the tubes into the peritoneal cavity, the patient on whom
the test is being carried out can be said to have no blockage either in the
uterus or fallopian tubes which would prevent the spermatozoon reaching the
ovum and fertilizing it. An assistant listening with a stethoscope over the
lower abdomen can hear the air leaving the fallopian tubes and entering the
peritoneal cavity.

but one cannot rely too much on such interpretations. A careful observation of the manometric pressure is the most reliable way of telling definitely whether or not the air passes out through the tubes.

The Rubin's insufflation of gas into the uterus and tubes is not only of diagnostic value, but deserves also to be considered as a definite therapeutic measure. Not infrequently conception will occur shortly after a Rubin's test in a woman who has been sterile for many years. This is probably due to the gas under pressure straightening out some kinks in the tubes and perhaps freeing some fine adhesions. Of course, when the adhesions are firm and keep the tubal lumina tightly closed such fortunate results do not occur. Some gynecologists are not satisfied with the information obtained by a Rubin's test and inject opaque substance into the uterus and tubes and then take roentgenograms of the pelvic organs. This procedure is called hysterosalpingography and it does more accurately localize the point of obstruction in the tubes than does a Rubin's test.

Lipiodol was the opaque substance first used to visualize the generative tract. However, it proved to be irritating to the peritoneum and so often serious results followed its use that visualization of the fallopian tubes fell somewhat into disrepute. Recently Titus, of Pittsburgh, has reported a series of cases in which he has used skiodan-acacia as an opaque medium and he claims that this product is not irritating and that its use in hysterosalpingography is absolutely safe.

When a Rubin's test, or an X-ray taken after the injection of an opaque material, indicates that the fallopian tubes are closed, it is of course extremely unlikely that conception will occur unless the woman submits to an abdominal operation. Nevertheless, before telling a woman that there is absolutely no chance of her becoming pregnant unless she is operated on, the senior author pre-

fers to repeat the Rubin's test and confirm his findings on the first occasion. This rules out the possibility that an error in technique may have been responsible for the results obtained at the first examination.

There are several operations that can be performed on patients with closed fallopian tubes and in each case the operation should be selected which is most suited for the individual patient. If the obstruction in the tubes is in the distal half, that part of the tube should be removed. When the inner half of the tube is obstructed, not only must that part of the tube be excised in which the lumen is occluded but the outer half of the tube must then be reimplanted into the uterus. When there are several obstructions in the tube it is sometimes necessary to do a complete salpingectomy. A large opening can then be left in the side wall of the uterus and the ovary on that side be brought through this opening and inserted into the uterus.

While it is true that some women have become pregnant following operations on the fallopian tubes it is only fair for every patient who is contemplating such an operation to know that only a small percentage of successes are obtained by these operations. Certainly not over 10 per cent of them are successful. Moreover, a considerable number of the women who do conceive fail to carry the pregnancy to term and abort during the first two months of pregnancy.

Some physicians believe that in a few instances conception does not occur because the diet of one or both of the marital partners is lacking in Vitamin E or whole wheat-germ oil. This idea arose from the fact that it has been shown that animals kept on a diet which is deficient in Vitamin E do not conceive. However, it so happens that the diets of most men and women contain plenty of Vitamin E so the absence of it must account for only a very small number of the cases of sterility, if it does account for any of them. Nevertheless, it is advisable to see to it

that both the husband and wife eat plenty of nourishing foods containing sufficient quantities of all of the vitamins. Attention should be given to the general health of both of the marital partners; sufficient rest and exercise are important factors.

One other interesting recently suggested cause of sterility is the possible failure of a woman to ovulate even though she menstruates. Studies of some of the colonies of higher monkeys have shown that although these animals menstruate regularly throughout the entire year they do not ovulate during the hot weather and so do not conceive during this time. This was discovered because it is possible in monkeys to palpate the ovaries so accurately that one can determine on just what day ovulation occurs. It is not possible by palpation to tell this in women, but by microscopic study of curettings obtained during the latter half of the menstrual cycle one can determine whether or not ovulation has occurred.

Sufficient statistics have not as yet been gathered from the studies of curettings for one to be able to judge just how often menstruation occurs without ovulation but probably this happens very rarely. In the treatment of sterility it is, clinically, more important to ascertain whether or not the couple desiring children understand in what part of the menstrual cycle a woman is fertile and in what part she is sterile. Many couples have entirely erroneous ideas on this matter. Some of them think that conception is especially apt to occur when coitus takes place just before and just after a menstrual period and have limited sexual relations to those times. Actually these are the times when a woman's fertility is lowest and unknowingly the couple have been practising a type of birth control known as "rhythm." Sometimes an explanation of this point and refuting the misinformation that they have gathered will result in the woman becoming pregnant.

A few successes have been reported following the intrauterine injection of fresh semen, known to contain active spermatozoa. This procedure should be carried out during the exact time of the month when the woman is expected to ovulate. The technique of artificial insemination is simple but the strictest asepsis must be carried out, as some serious infections have occurred following this procedure.

# GYNECOLOGICAL CYSTS AND TUMORS

A *cyst* is a sac containing a liquid or semiliquid substance. A *tumor* is a mass of tissue which grows independently of its surrounding structures and which has no physiological use. Another term for a tumor is a neoplasm. Tumors are divided into two groups, the benign or innocent and the malignant which is cancer. Benign tumors are usually encapsulated and grow by pushing the surrounding tissue aside. Malignant tumors infiltrate or invade the surrounding tissue and metastasize, which means that pieces of the original growth break off and are carried by the blood and lymph streams to other parts of the body where they produce secondary growths similar to the original. In most cases a pathologist, after examining a small piece of a tumor, can say whether or not he is dealing with a benign or malignant condition, but sometimes this is a very difficult decision to make. Particularly is it true of some tumors that arise from the ovary that even microscopic study cannot definitely show whether or not they are malignant.

A fairly satisfactory way to discuss gynecological tumors is to start with those that are seen on the external genitalia and then later to consider those arising in the internal organs of reproduction. In women beyond the menopause one not infrequently sees malignant tumors of

the vulva. They are apt to arise in either the clitoris or labia majora. The symptoms are itching or pruritus, leucorrhea, and a bloody discharge. Itching has been present in some of these cases for many years before the malignancy develops and this symptom, if it is not due to diabetes or trichomonas vaginalis, is usually the result of a condition called kraurosis vulvae, which occurs almost exclusively in older women. Characteristically with kraurosis there is a shrinking of the skin and a loss of subcutaneous tissue. Fissures or cracks develop and secondary inflammation is apt to occur. White spots appear on the shrunken areas and these spots are described under the term leukoplakia. There is no place in the body where the term precancerous is more justified than it is in describing these leukoplakic lesions of the vulva. Kraurosis is usually treated by estrogen therapy, but if there is any leukoplakia radical surgical resection of the vulva should be recommended. Carcinoma of the vulva may be treated by either radium or surgery, but most authorities feel that a complete vulvectomy with a removal of the surrounding glands yields better results in the treatment of this particular type of malignancy than does radium or X-ray.

A small tumor often seen at the external urinary meatus is the **urethral caruncle.** It is benign but causes the patient considerable discomfort for it is sensitive to touch and the clothing irritates it by rubbing against it. A urethral caruncle is best treated by burning it off with electricity, a procedure known as fulguration.

**Bartholin gland cysts** may develop on the sides of the vulva. They are usually caused by gonorrheal infection and are best treated by complete surgical excision. Tumors in the vagina are rare and when they do occur they are most often seen in children and are usually very malignant. Microscopic study usually shows that they be-

FIG. 25.—This shows the three areas in the uterus in which cancer most often arises. It is possible to see the growth in its earliest stage only when it arises from the lower part of the cervix. When it starts in the cervical canal or body of the uterus an early diagnosis can only be made by the microscopic examination of curettings. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)

long to the group of malignant neoplasms called sarcomas because they arise from connective tissue.

There is no topic of more importance in gynecology than **cancer of the cervix.** The following statistics emphasize this. One-third of all the cases of cancer seen in women originate in the uterus and four out of five of these arise in its cervical portion. In the United States alone, from fifteen thousand to eighteen thousand women die every year from uterine cancers. Fifty-five per cent of these deaths occur between the ages of thirty-five and fifty. The only hope of lessening this tremendous loss of

FIG. 26.—A carcinoma arising from the anterior lip of the cervix. The uterus has been opened and the posterior half removed. The specimen is seen from the back. The growth is cauliflower-like in appearance and bleeds when touched. It was not recognized in its earliest stage but as the cancer had not involved the body of the uterus, tubes, or ovaries and as the broad ligaments were apparently not involved this patient had a fair chance of being cured by either radium or surgery. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

life is to impress on women the necessity of being examined as soon as they develop any symptoms which may be due to gynecological cancer. If these patients are to be cured they must be seen early. This is equally true whether they are to be treated by either surgery or radium. Today the only cases of cancer of the cervix that are operated on are those seen in the earliest stages and some gynecologists think that even the very early cases are better treated by radium than by surgery.

In its earliest stage a carcinoma of the cervix appears as a localized papillomatous condition but before long an

ulcer develops which becomes indurated. On palpation the gynecologist notices in the early cases that a certain area in the cervix either is friable or is unusually firm. When the condition is more advanced, large cauliflower-like masses which bleed when touched may grow downward from the cervix and fill the vagina or, if the cancer is growing inward or inverting, the cervix may become so ulcerated and eaten away that only a crater-like shell of it remains.

The **early symptoms of cancer of the cervix** are a thin watery discharge and a little irregular bleeding. If this discharge is foul in character the likelihood of its being due to cancer is increased. No matter how slight may be the bleeding between the periods it should not be neglected. It may be the first warning of cancer. Not infrequently the first signs of bleeding will appear following sexual intercourse or perhaps after a woman has taken a douche. The older textbooks gave pain, cachexia, and loss of weight as symptoms of cancer. These are symptoms not of an early malignancy but of a growth that has advanced so far that surgery can offer the patient no help, and radium can seldom cure her although it may make her more comfortable. Nurses and physicians must be constantly on the lookout for the earliest signs of cancer and not be content to recognize the condition when it is in an advanced stage.

In the detailed consideration of carcinoma of the uterus it must be remembered that the womb is pear-shaped and divided into two parts, the cervix or stem of the pear which dips down into the vagina, and the body or upper rounded portion which lies in the peritoneal cavity. Cancer develops both in the cervix and in the body of the uterus and, while the symptoms arising from cancer in these two locations are the same, the age incidence and the prognosis vary according to the part of the womb from which the malignancy arises. Cervical cancer is

Fig. 27.—This is a drawing made from an autopsy of a patient who died from uterine cancer. The upper part of the vagina and the greater part of the body of the uterus are occupied by the malignant growth and the cervical landmarks are entirely obliterated. The upper margin of the cancer is irregular but sharply defined and stands out clearly from the uterine muscle which is much darker in color. The cancer has eaten into the bladder, producing a vesicovaginal fistula. This of course added to the misery of the patient during her last days. It is only by examining patients when they have the very first warnings that they may have a cancer that the large number of such tragic deaths which occur yearly may be lessened. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

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usually seen in women between the ages of thirty-five and fifty and 95 per cent of the women with this type of malignancy have borne one or more children. Rarely does one see cancer of the cervix in a nullipara. In contrast to this, cancer of the body of the uterus usually develops in women between the ages of fifty and sixty and is seen just as often in the nulliparous woman as in multiparae. The prognosis is apt to be much better for the woman with carcinoma of the body of the uterus than for the one who has cervical carcinoma, provided she reports to the physician soon after the first symptoms appear. This is because the body of the uterus lies free in the peritoneal cavity and in the early stages of this condition the cancer remains limited to the uterus. The surrounding tissues are not involved until the growth becomes fairly extensive. On the other hand, a cancer arising in the cervix or neck of the womb may very early invade the broad ligaments, the rectum, or the bladder, to which structures it lies in close proximity. Radium has almost completely supplanted surgery as a method of treating malignancy of the cervix, but most gynecologists still operate on early cases of cancer of the body of the uterus. The operation consists of a panhysterectomy, which means that the entire uterus is removed. Usually a cuff of the vagina is removed with the uterus. The object of this operation, and indeed of all operations performed for malignancy, is to get beyond the borders of the cancer. If any cancer cells are left, the patient is not cured. However, postoperative radiation may sometimes supplement the work of surgery and destroy the cancer that has been left at operation provided the condition is not too extensive. Nevertheless, surgery should not be advised unless the operator feels that there is considerable likelihood of his removing all the cancer.

The discussion of tumors of the womb was started with a consideration of cancer of the cervix and body of the
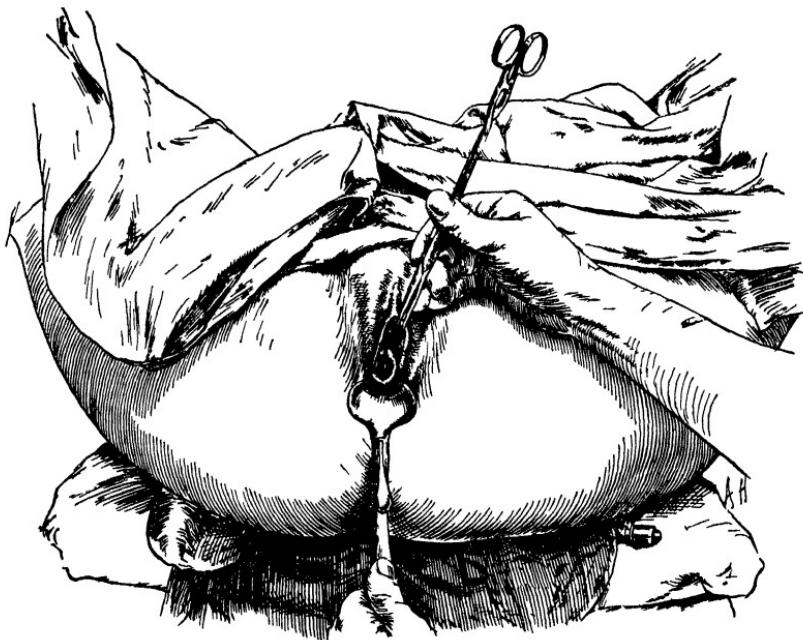
FIG. 28 —A cervical polyp  Polyps are one of the commonest causes of irregular bleeding  Fortunately only a very small percentage of them are malignant  (Kelly, Howard A  *Medical Gynecology*  D  Appleton Company )

uterus in order to emphasize the tremendous importance of these conditions. However, most of the tumors that arise from the womb are benign. They are not cancer. Not infrequently one sees **polyps** protruding from the external os of the cervix. These are smooth, soft, pedunculated growths that arise from the mucous membrane. They usually cause leucorrhea and irregular uterine bleeding or metrorrhagia. The great majority of these polyps start as a benign process and remain so, but a few of them undergo malignant degeneration. Because of this every polyp that is removed should be examined microscopically in order to be certain that no malignancy is present.

**Myoma,** fibromyoma, or fibroma are terms that are applied to the tumor that most frequently arises in the uterus and sometimes it is spoken of simply as a fibroid

growth. It is made up of muscular and fibrous tissue arranged irregularly. Why fibroid tumors develop in the uterus is not known, but it has been observed that they occur more frequently in women who have not had children than in those that have. A few women in their late twenties develop fibroid tumors of the uterus but most often they are seen in women between the ages of thirty and fifty.

Myomas vary in size from the little seedling only about 1 cm. in diameter up to the enormous tumors that are occasionally seen. The largest fibroid tumor that the senior author has removed weighed nineteen pounds and filled a washtub. There is a fibroid tumor half of which is still on exhibition in the Surgeon General's Museum in Washington that weighed ninety-five pounds. After Dr. T. S. Cullen removed it the patient weighed ninety pounds. She recovered from the operation.

There is considerable variation in the symptoms caused by fibromyomata. This depends to some extent on the size of the growth but even more on its location in the uterus. These tumors are divided according to position into three groups, the subserous, the interstitial and the submucous.

The first variety, namely the *subserous,* comprises those tumors which grow toward the peritoneal covering of the uterus. They seldom cause excessive uterine bleeding and they may produce no symptoms until they become quite large.

The *interstitial* fibroids are situated in the midportion of the womb and are completely surrounded by uterine musculature. They too do not often upset the regularity of the menstrual cycle.

The *submucous* fibroids are the tumors which, even when they are small, cause excessive menstrual bleeding and bleeding between the periods, for they grow towards the endometrium or mucous membrane lining the uterus
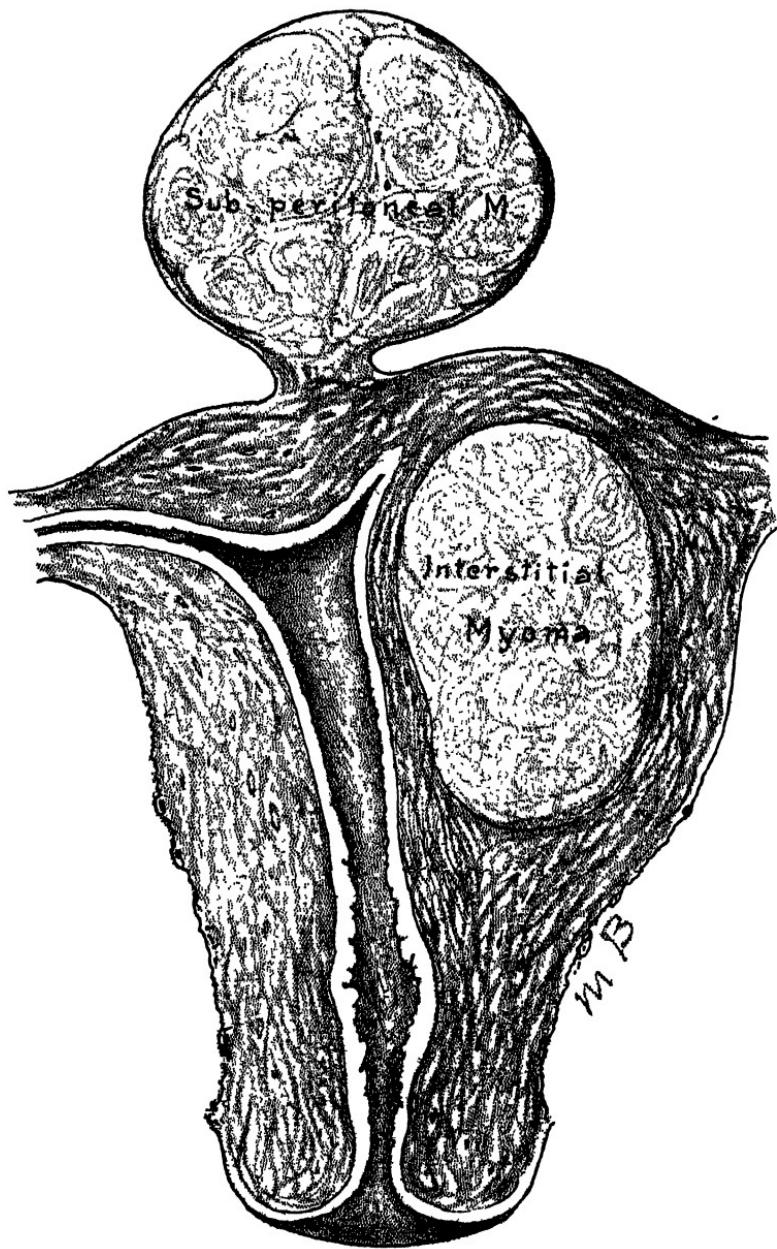
FIG. 29.—This diagram shows a pedunculated subserous or subperitoneal myoma and an interstitial or intramural myoma. These varieties of fibroids are not so apt to cause uterine hemorrhages as are the submucous fibroids. (Kelly, Howard A. *Medical Gynecology.* D. Appleton Company.)
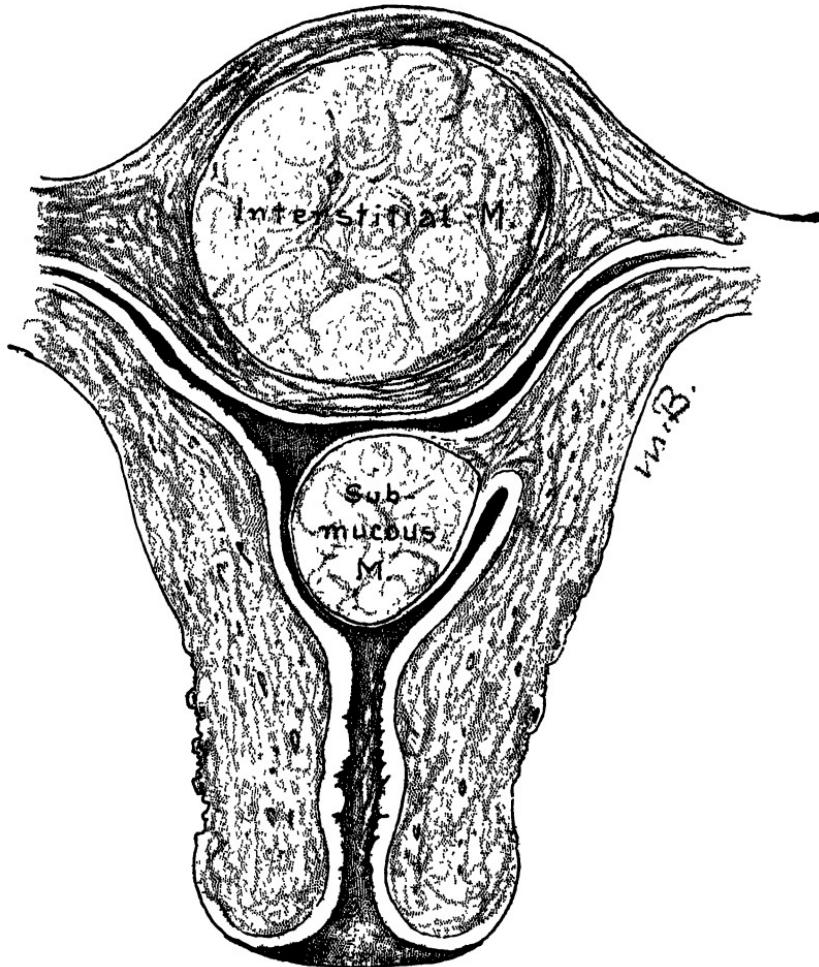
Fig. 30.—A uterus containing an interstitial and a submucous myoma. The latter is becoming pedunculated. A patient with such a tumor will probably have irregular uterine bleeding and profuse menstrual periods. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

and cause it to become markedly congested. Sometimes submucous fibroids project into the uterine cavity and may become entirely detached from the womb except for a small pedicle. When this happens the tumor is called a pedunculated fibroid.

Fig. 31.—A large myoma developing in the anterior wall of the uterus. The tumor fills the pelvis and presses on both the bladder and rectum. A patient with such a tumor will have great difficulty in emptying the bladder and lower bowel. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

Large myomata or fibromata, no matter where they are situated, are apt to cause symptoms by pressing on the surrounding structures. The patient usually develops a leucorrheal discharge, excessive bleeding with the menstrual periods, metrorrhagia, sterility, backache, and lower abdominal pain. If the tumor presses on the bladder the patient may have difficulty in voiding and if the myoma extends backward towards the rectum she may find it difficult to evacuate the lower bowel.

FIG. 32.—The irregular outline of a large fibroid tumor which distends the abdomen can be seen. (Kelly, Howard A. *Operative Gynecology.* D. Appleton Company.)

**Treatment of myomata.**—If a woman has a small fibroid tumor of the uterus which is giving her no symptoms, no treatment is indicated but she should have a pelvic examination made every six months. If the fibroid tumor is large or if it is of moderate size and causes excessive bleeding or pain, operation, deep X-ray or radium should be advised. It is the opinion of the senior author that usually better results are obtained by operation than by X-ray or radium but a few authorities will disagree with this opinion. However, it is true that radium and X-ray affect the ovaries as well as the uterus while, even if it is necessary surgically to remove the entire uterus because of multiple fibroid tumors, the ovaries will continue to function after the operation. The operations performed for myomata uteri are myomectomy and hysteromyomectomy.

*Myomectomy* means the surgical removal of a myoma and if the patient has several tumors, which is usually the case, such an operation is spoken of as a multiple myomectomy. The patient continues to menstruate after a myomectomy and in young women who desire to have children this operation is sometimes the procedure of

choice. However, there are certain definite disadvantages to a multiple myomectomy. For instance, when several large myomata are present there are usually also a number of small ones scattered through the uterine musculature and the surgeon may unwittingly leave some of these. Then as the small tumors enlarge the patient may have a return of symptoms and a hysterectomy may later be necessary. Moreover, when there are a large number of myomata present it is safer to remove the entire uterus because when a multiple myomectomy is performed there may be difficulty in controlling the hemorrhage which results from the numerous incisions that must be made into the uterus. *Hysteromyomectomy* means the removal of a uterus containing myomata but often a surgeon will speak of such an operation simply as a hysterectomy, which indicates that the womb has been removed without indicating that the uterus contained myomata.

Myomatous tumors are very apt to undergo one or more types of degeneration. The commonest of these is hyaline degeneration which is often accompanied with some liquefaction. About 1 per cent of myomatous tumors of the uterus undergo malignant degeneration, that is, they become cancerous. Speaking exactly, the type of cancer that is seen in these tumors is not a carcinoma such as so often arises from the mucous membrane of the cervix but is a sarcoma, or the malignant tumor that arises from connective tissue.

Once in a while a patient becomes pregnant and instead of the tissue developing normally into a child, the chorionic villi degenerate and a so-called *hydatidiform* mole results. The following would be characteristic of this process. A woman misses two menstrual periods and on examination is found to have a uterus the size of a five-months' pregnancy. She then starts to bleed and passes large clusters of material that look like small grapes. They are the vesicle-like hydatids. The treatment of a

hydatidiform mole is simply to empty the uterus, for the condition is a benign one. However, the patient should be carefully watched for at least six months after the mole has been expelled for occasionally a malignant process known as a *chorioepithelioma* arises from a hydatidiform mole.

When one considers how active the ovaries are and that they are always undergoing changes it becomes easier to understand why it is that so many different types of cysts and tumors arise from the ovary. First of all, there are the cysts that develop through the retention of products that are normally expelled. For instance, an ovum or egg starts to develop but for some unknown reason this development may cease and the ovum degenerates, forming a large quantity of fluid which distends the Graafian follicle from which the ovum had arisen. Such is the way that a Graafian follicle cyst arises. Another type of retention cyst often seen is the corpus luteum cyst. The commonest of all large ovarian cysts is the multilocular cystadenoma. The term means a cystic tumor which is made of many compartments. Some of these tumors are filled with a material known as pseudomucin and they are then sometimes spoken of as pseudomucinous cysts. Sometimes they reach a tremendous size, weighing twenty, thirty, or even ninety pounds, the weight being due mostly to the large amount of fluid that they contain. Some of these cystadenomata have numerous finger-like pedunculated growths protruding from their outer walls or hanging down into the cyst cavities. These tumors are then spoken of as papillary cystadenomata. They form a particularly interesting group of tumors when considered from the point of view of the pathologist, for in an individual case it is sometimes difficult to determine whether or not cancer is present. Therefore, a very guarded prognosis must be made.

The first ovary ever removed surgically contained a large cystadenoma. The operation was performed by Ephraim McDowell in 1809 on a Mrs. Crawford. Funds were solicited recently for the erection of a monument to McDowell in Danville, Kentucky, where he performed this operation. It would seem perhaps fitting that another monument should be erected to Mrs. Crawford, who had the courage to allow Doctor McDowell to operate on her long before anesthesia had been discovered. McDowell removed a tumor that weighed fifteen pounds. His account of this first ovariotomy is interesting. He wrote that after the incision was made the intestines rushed out on the table and, so completely was the abdomen filled with the tumor, that the intestines could not be replaced during the operation which lasted twenty-five minutes. After removing the tumor the patient was turned on her side to permit the blood to escape. McDowell was very much surprised when he visited Mrs. Crawford five days after the operation to find her engaged in making up her bed.

The *dermoid* is a type of ovarian cyst of unusual interest. It arises from primitive germ cells and in a sense might be considered as another individual included in the patient's ovary. Dermoids usually contain skin, teeth, and hair and occasionally miniature gastrointestinal tracts. There is said to have been one of these cysts which contained a complete eye.

The *endometrial cyst,* or the *chocolate cyst* as it is sometimes called, is occasionally seen in the ovary. These cysts have a lining of cells which are the same as those which line the uterine cavity and when a woman menstruates these cells bleed just as do cells of the same type in the uterus. In other words, a woman with such a condition menstruates not only with cells lining the uterine cavity but also with these cells in the ovary. This leads to a filling of the ovary with blood and as the blood becomes old, due to degenerative changes, its color changes from bright

Fig. 33.—A large dermoid cyst of the ovary. While the anterior abdominal wall is pushed out by the cyst just as it is by a fibroid the enlargement is symmetrical and globular rather than definitely irregular. (Kelly, Howard A. *Gynecology*. D. Appleton Company.)

red to chocolate and thus these cysts have acquired the name of chocolate cysts. They are really part of a condition known as *endometriosis* which may be considered briefly at this point.

In some women the endometrium, or lining of the uterus, extends far into the uterine musculature and islands of endometrial cells may be seen lying deep in the muscles entirely separate from the uterine cavity. When these groups of endometrial cells are found in myomata the patient is said to have an adenomyoma or an endometrioma. Some of these endometriomata are the direct result of an invasion of the endometrial cells into the uterine musculature. However, this does not explain the presence of the similar islands of endometrium which sometimes are found in chocolate cysts of the ovary or in the small hemorrhagic cysts scattered over the entire pelvis. These latter endometriomata are believed to develop in the following manner: At menstruation many
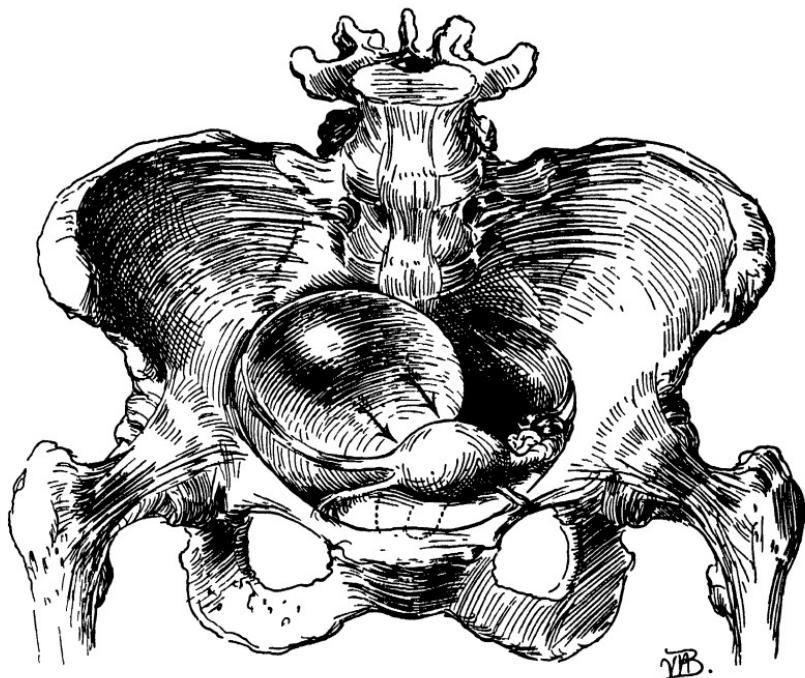
FIG. 34.—An ovarian cyst arising from the right ovary and pushing the uterus to the left. The left tube and ovary are normal. (Kelly, Howard A. *Operative Gynecology*. D. Appleton Company.)

endometrial cells become detached from the uterus. Most of these cells are necrotic when detached but some of them may remain viable and be carried back through the fallopian tubes to the ovaries and pelvis, where they are implanted and continue to live.

That at times some menstrual blood flows backward from the uterus through the tubes to the peritoneum has been proved by observing the pelvic structures in women who are operated on while menstruating. This retrograde flow of menstrual blood occurs most often in a uterus in retroposition, and some gynecologists feel that because of the danger of endometriosis developing, a suspension of the uterus is indicated in every woman with a retroposition even though the latter is causing her no symp-

toms. Many gynecologists, including the senior author, feel that this is too radical a view to take in the matter.

Sometimes chocolate cysts of the ovaries rupture, due to trauma or other causes, and when this occurs the material that pours out may irritate the peritoneum and cause the development of adhesions. In marked instances of endometriosis one may find the uterus, ovaries, and several loops of small and large intestine bound tightly to each other with adhesions presenting a picture which, in some ways, resembles that seen in cases of chronic pelvic inflammatory disease due to the gonococcus. However, the presence of a chocolate cyst in the ovary and of perhaps small endometriomata scattered over the pelvic peritoneum, and the absence of inflammation in the fallopian tubes differentiate endometriosis from gonorrheal inflammation of the pelvic structures.

The **symptoms of endometriosis** are severe pain with the periods and excessive menstrual bleeding. If a low-grade peritonitis is caused by the rupture of a chocolate cyst the patient may have constant lower abdominal pain. If the endometriomata press on or invade the rectum and bladder the patient will then complain of marked constipation and dysuria occurring just at the menstrual periods. Instances have been reported of bleeding from the rectum and bladder occurring each month due to the fact that the endometriomata become large and menstruate at this time.

It is often difficult to diagnose endometriosis, and the condition may be thought of for the first time when the pelvis is inspected at an operation performed for what was thought to be salpingitis. However, the history may be helpful and if, along with a suggestive history, the examiner finds the patient has a uterus in retroposition and thickening of the uterosacral ligaments he may be able to diagnose the condition.

The **correct** treatment of endometriosis varies accord-

ing to the age of the patient. It is not necessary to remove the uterus unless it is markedly enlarged, and a resection of the bladder or rectum is never justified even though the endometriosis is invading these strictures. Removal of the ovaries causes these growths to recede and finally disappear. A bilateral oophorectomy is the ideal operative treatment for endometriosis. However, in younger women, especially those under thirty-five, the removal of both ovaries is a radical procedure and may bring on marked menopausal symptoms. In such cases one may remove merely the endometrial cysts and one ovary or an ovary and a half. However, these more conservative operations are not always successful as even a small portion of one ovary is sufficient to stimulate the endometriosis to continue to grow. Sometimes it becomes necessary at a later date to perform a second laparotomy and remove all the remaining ovarian tissue.

Once in a while a fibroid tumor will develop in an ovary with a structure similar to the fibroid tumors which are so common in the uterus. However, one sees very little, if any, muscular tissue in these fibroid tumors of the ovary, while in the uterine tumors there is always at least a fair percentage of smooth muscle tissue. For some reason not yet entirely understood fibromata of the ovary usually cause the development of considerable clear or straw-colored fluid in the peritoneal cavity. However, a much commoner cause of such ascites is cancer of the ovary. Malignancy of the ovary is not seen as often as is uterine cancer but it is to be dreaded even more than cancer of the cervix for, no matter what treatment women with carcinoma of the ovary receive, only a small percentage of them are saved. This of course is largely due to the fact that ovarian cancer is usually not recognized until the condition is advanced.

The group of papillary cystadenomata of the ovary has already been mentioned. Here even with a microscope

it is sometimes difficult to tell whether or not cancer is present. More malignant than this group of tumors in which the microscopic picture is equivocal are the papillary carcinomata which microscopically show definite malignant changes. Finally there is a group of solid cancers of the ovary which grow very rapidly and metastasize early. When a patient with such a neoplasm is operated on, the peritoneal cavity is usually found to be filled with bloody fluid and the peritoneum and intestines to be covered with secondary growths. The physician has to be careful not to confuse this condition with tuberculous peritonitis in which there may also be a tremendous amount of ascites, for this ascites plus the tubercles scattered over the peritoneum and intestines may present a picture strongly suggesting malignancy.

A rare but interesting group of ovarian tumors, which recently has received considerable attention, is formed by those neoplasms which might be said to alter the sex of the patient. There is a time early in embryonic life when apparently nature has not made up her mind whether a particular fertilized egg will develop into a male or female, and at this stage the male and female elements are present in equal proportion. Certain conditions then arise which determine nature's choice in this matter, but there always remain in every individual some embryonic elements of the other sex. As extreme examples of this there are the true hermaphrodites of which there have been only about half a dozen of proved cases. Such an individual has the internal reproductive organs of both sexes, that is, has both ovaries and testes.

While true hermaphrodism is very rare the gynecologist ever so often sees instances of false or incomplete hermaphrodism. Such an individual may have the external genitalia of the female and the gonads or internal sex organs of the male or vice versa. The true sex of such an unfortunate person is determined by the internal or-

gans of generation. They are men or women depending upon whether they have testes or ovaries. However, when a physician is called on to decide whether an individual should be accepted by society as a male or female he must take into consideration the age and the manner in which the individual has lived before the bisexuality was recognized. If this decision is made in infancy the actual findings on examination are all that matter. However, if the individual is no longer a child other circumstances must be considered. For instance the senior author remembers the case of a sixteen-year-old individual who was operated on for an inguinal hernia with a supposed undescended testicle. The patient had always been brought up as a boy, had attended a boys' boarding school and played on the baseball team. To the complete surprise of every one in the operating room, the undescended testicle turned out to be an ovary. It would have, of course, been impossible to take such an individual out of a boys' boarding school and put dresses on him. Scientific accuracy must in such instances yield to common sense.

Hermaphrodism has been discussed partly as a means of leading up to a consideration of the rare group of tumors which, as has already been mentioned, is now causing so much interest among gynecologists. Two members of this group of tumors are the granulosa cell tumor and the arrhenoblastoma. The granulosa cell tumors arise from the granulosa cells lining the Graafian follicles and they cause increased female sex activity. When a child, perhaps three or four years of age, starts to menstruate regularly, or a woman of sixty years whose menopause ended ten years previously has a return of regular monthly bleeding, one can be almost certain that these patients have granulosa cell tumors of the ovary. Sometimes these neoplasms are so small that the diagnosis must be made entirely on the history.

The arrhenoblastomata on the other hand cause a de-

velopment of male characteristics in women. A woman with such a tumor is apt to stop menstruating. The breast tissue disappears and there is a shrinking in size of the female external genitalia except for the clitoris which undergoes tremendous hypertrophy. Such a patient may develop so much hair on the face as to make it necessary for her to shave daily. After the removal of the arrheno-blastoma the male characteristics usually disappear and the woman before long starts to menstruate normally. The breast tissue hypertrophies and the clitoris returns to normal size.

**Symptoms of ovarian cysts.**—Many cysts produce no symptoms and are accidentally found on examination. Sometimes they do cause irregularity in the menstrual cycle and if they are large enough they may cause symptoms by pressing on the surrounding structures. Fibromata, papillary cystadenomata, and malignant ovarian cysts cause ascites or fluid in the peritoneal cavity and thus may cause a tremendous distention of the abdomen. The fluid seen in cases of fibroma of the ovary is usually clear. When the surgeon opens the peritoneal cavity and finds bloody fluid, the patient probably has a cancer of the ovary.

One danger associated with all ovarian cysts is that the pedicle by which they are attached may become twisted. When this occurs the blood supply is cut off and degenerative changes at once occur in the cyst. The patient then experiences severe one-sided pain and may go into collapse. Sometimes peritonitis develops with surprising rapidity. This complication, namely the twisting of its pedicle, seems to occur oftener with dermoids than with any other type of ovarian cyst. As soon as the diagnosis of an ovarian cyst with twisted pedicle is made the patient should be operated on at once. This condition is as much of a surgical emergency as is acute appendicitis or ruptured ectopic pregnancy.
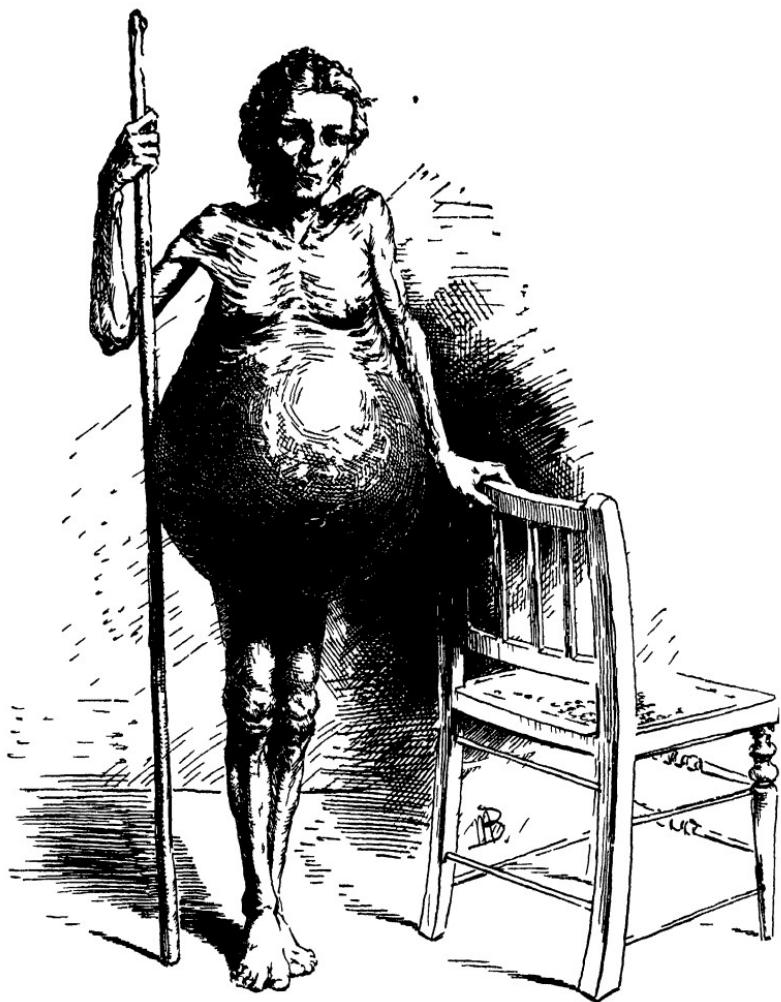
Fig 35 —An enormous ovarian cyst  Marked emaciation is often seen in patients with enormous tumors and cysts even when they are not malignant. Fortunately one rarely sees today cases such as this one as now women are usually operated on before the cyst reaches such a tremendous size. (Kelly, Howard A  *Operative Gynecology*  D  Appleton Company )

**Treatment of ovarian cysts.**—The treatment of all ovarian cysts, excepting the small ones due to retention of fluid in the Graafian follicles or corpora lutea, *is operation*. To put this more specifically, any ovarian cyst larger than a good-sized lemon should be removed. This is advised because as long as the cyst remains in the patient two dangers are present. First, as has already been mentioned in discussing dermoids, the cyst pedicle may become twisted. Secondly, one can never be sure that an ovarian cyst is not malignant until it has been removed and examined microscopically. Only a very small percentage of the fibroid tumors that arise in the uterus are malignant, probably not more than one in two hundred, and hence a patient with a moderate sized myoma may with impunity keep it so long as it gives her no symptoms but, in the treatment of moderate-sized ovarian cysts, such conservatism is not justified. The treatment of ovarian cysts and of cancer of the ovary is surgical. However, following operations for ovarian cancer, X-ray and radium are employed as an adjunct to surgery in the hope that they may destroy any cancer cells not removed surgically.

# GYNECOLOGICAL  SURGERY

The **routine preparation of patients for operation** dif
fers in many institutions. One hospital will emphasize the
importance of certain procedures, while another may omit
those advocated by the first hospital and recommend en-
tirely different preoperative measures. One of us (Brady)
has often had the unenviable experience of having his pri-
vate patients distributed in four or five hospitals. This
has necessitated a large expenditure of time in going
from one institution to another but has had the one ad-
vantage of showing that equally good operative results
can be obtained when different preoperative routines are
followed. So long as a routine is a satisfactory one, minor
details do not seem to influence the operative results so
much as does the thoroughness with which the routine is
carried out. All preoperative preparations have as their
ultimate aim a clear field for the operation and increased
postoperative comfort for the patient. The following is a
résumé of the preoperative routine on the Gynecological
Service of the Johns Hopkins Hospital.

After the order for operation has been posted the pa-
tient receives nothing by mouth except water. The post-
ing of a patient for operation cancels all previous orders
that may have been left. A soapsuds enema is given early
on the morning of operation but no cathartics are ad-

ministered. A voided specimen of urine is sent to the laboratory. A hypodermic injection of 12 mgm. (gr. 1/6) of morphia and 0.6 mgm. (1/100 gr.) of atropine sulphate is given to the patient when she is called to the operating room. The morphine quiets the patient's nerves and lessens her apprehension. The atropine is given for the purpose of lessening the bronchial and nasal secretions. Preliminary medications other than morphia are sometimes prescribed but they all serve the same purpose.

The care of the patient on her arrival in the operating room is of great importance. Her first impressions influence greatly her attitude towards the operation she is about to have performed. The nurse who meets the patient in the operating room suite should be cheerful and pleasant but also firm in her actions. Every effort should be made to obtain the patient's confidence.

To facilitate the work in the department, the patient is shaved in her bed early on the morning of operation. This is an important step in the preoperative care and should be done carefully and thoroughly. In preparation for an abdominal operation the patient is shaved from the nipple line to the rectum, cleansing a large area in every direction from the region in which the incision is to be made. In doing this a solution of 70 per cent alcohol is used on the abdomen; green soap on the pubic region and perineum. When the operation is to be a vaginal one only the pubic region, vulva, and perineum are shaved.

Upon her arrival in the anesthesia room the patient is placed on a table over the lower end of which has been hung a Kelly pad. A hip-length ether jacket and canton flannel hose (38 inches long) are then put on the patient. As patients have been known to get nasty bruises or cuts from lying on hairpins during an anesthetic, the nurse looks for pins or clips before placing a cap over the hair. Jewelry and false teeth are also removed. If the patient must wait for a time before the anesthetic is started she

FIG 36 —A patient prepared for a perineal operation The anterior lip of the cervix has been grasped with a tenaculum and the cervix drawn down ward A retractor holds the posterior vaginal wall out of the way These are the first procedures carried out when an operator is about to either dilate the cervix, curette the uterus, or carry out a plastic operation on the cervix (Kelly, Howard A *Medical Gynecology* D Appleton Company )

is made as comfortable as possible, warmly covered, and the room darkened. If an analgesic has been used as a preliminary drug, the patient must be constantly attended by the nurse responsible for the ether room.

An orderly and a nurse assist the anesthetist while the patient is being anesthetized. After that the orderly leaves and the nurse helps the doctor with the examination, catheterization, and vaginal preparation of the patient. It is advisable to catheterize patients whose abdomens are to be opened through a lower midline inci-

sion and those who are to have anterior colporrhaphies and vaginal hysterectomies, but it is not necessary to do this to women who are to have only a diagnostic curettage. The method of preparing anesthetized patients for catheterization differs from the routine used on patients on the ward, which will be described in chapter XV. In the operating room the doctor simply exposes the external meatus by separating the labia minora, washes the exposed area with tincture of green soap, flushes the urethra with sterile water, then with a solution of 1-1000 bichloride of mercury and finally with 70 per cent alcohol. A glass catheter is then passed into the bladder.

Patients receive a vaginal clean-up preceding every gynecological operation. The external genitalia, a portion of the thighs, and the vagina are thoroughly washed with green soap and rinsed with sterile water. Then, using sterile sponges on a sterile sponge-stick [1], the vagina is swabbed with bichloride of mercury in a solution of 1-1000 and finally with 70 per cent alcohol. After the clean-up is completed the Kelly pad is removed and the patient's position given a final adjustment before the operation is started.

Muscle support must be considered when a patient is adjusted for a laparotomy to be done in the Trendelenburg position. A rubber-covered pillow is placed under the small of the back to relieve strain. The arms are held comfortably but firmly in position by a canvas arm-sheet. The shoulders are braced with metal supports which are covered with heavy felt and rubber, preventing injury to the nerves going to the arms. The body is so placed that the knees will bend normally with the break of the table, thus dividing the weight strain. The legs are covered with a woolen blanket folded in a sheet. The abdomen is covered with a clean absorbent towel which when folded

[1] Instruments spoken of in Baltimore as sponge-sticks are in some cities called sponge-holders or sponge-forceps.

back for the abdominal clean-up gives added protection.

For a vaginal operation the clean-up is now complete; if abdominal work is to be done the abdomen is cleansed as well. The method and solutions used for abdominal clean-up vary with the operator, but the usual procedure is as follows: The patient's abdomen and umbilicus are thoroughly cleansed with a solution of iodine and benzene 1-1000. This removes dirt and grease from the skin. The doctor responsible for the clean-up is handed five sterile 7½-inch sponge-sticks with sponges attached. Iodine (3½ per cent) is poured over the first of these by the utility nurse and the umbilicus is filled with a few drops of this solution. After the abdomen is painted thoroughly the sponge and stick are discarded. Full-strength iodine is poured over the second sponge and the same area painted again. The iodine is allowed to dry and is then removed with two sponges of 70 per cent alcohol used consecutively. The remaining dry sponge is used to wipe off the line of incision and wipe out the umbilicus which has held iodine from the beginning of the clean-up. One of the doctors assisting at the operation then drapes the operative field with sterile towels and an abdominal sheet.

**Hysterectomy** is the removal of the uterus. This operation may be performed through the abdomen or through the vagina. It is called a *panhysterectomy* when the entire uterus is removed and a *supravaginal* or *partial hysterectomy* when it is amputated above the cervix. Confusion sometimes exists in the minds of nurses and medical students as to just what is meant by the term panhysterectomy. They are apt to think that this operation includes the removal of the ovaries and fallopian tubes. This is not the case. A panhysterectomy means the removal of the entire uterus and nothing more than that. The adnexae (meaning the ovaries and fallopian tubes) may be saved when a panhysterectomy is performed and, on the other

Fig. 37.—The cervix is being stretched with Goodell dilators. These are the instruments used by most gynecologists for a routine dilatation of the cervix preceding a curettage. However, when the purpose of the dilatation is to relieve dysmenorrhea the Hegar dilators are, in the senior author's opinion, preferable. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

hand, they may sometimes be removed when the uterus is amputated above the cervix.

A hysterectomy may be indicated because of a number of different gynecological conditions and is, very likely, the major operation most often performed by a gynecologist. Although surgery is now seldom recommended for carcinoma of the cervix it is still advised for malignancy of the body of the uterus. Then too, it is the opinion of

FIG. 38.—A globular myoma in the posterior wall of the uterus has been delivered through an abdominal incision. The intestines have all been packed out of the operative field with gauze packs. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

most specialists that a hysterectomy is indicated in cases of myomata uteri whenever the tumors reach considerable size or cause symptoms. It is, however, because of inflammatory disease that probably the greatest number of such operations are performed. A hysterectomy is necessary in so many of these cases because inflammatory exudate from the fallopian tubes often extends on to the uterus and binds it down with firm adhesions. Other rarer conditions such as sarcoma and other unusual uterine tumors are also best treated by a hysterectomy.

There is some difference of opinion among gynecologists as to when a panhysterectomy should be performed and when the surgeon should be satisfied to leave the cervix. Some authorities believe that whenever a hysterectomy is indicated, all the uterus should be removed. In support of this contention they point out that when the cervix is left, there is a chance of it undergoing malignant degeneration at some later date. Other authorities maintain that if the cervix is normal and the operation is not being performed for any type of pelvic malignancy, it is better judgment to carry out only a supravaginal hysterectomy, for the removal of the entire uterus is the more difficult of the two operations and is usually associated with a higher mortality and morbidity. In our opinion it is better to have no fixed rule as to which type of hysterectomy should be performed but to decide this according to the special indications in the individual case, remembering that in pelvic malignancy the more radical operation is always indicated.

The extent to which gynecologists avail themselves of the vaginal route in doing hysterectomies varies greatly. Indeed the difference in the percentage of hysterectomies performed through the vagina is often the outstanding difference in the work done in two equally good clinics. There is less danger of injuring the ureters and intestines in operations performed through the abdomen but operations performed through the vagina, even though often more difficult to carry out, are less shocking to the patient.

The preoperative preparation is the same no matter what type of hysterectomy is contemplated. Even though a supravaginal hysterectomy at first seems indicated, a surgeon may later decide because of the conditions unexpectedly found in the pelvis, to remove the entire uterus. Hence, the vagina should always be prepared so that a
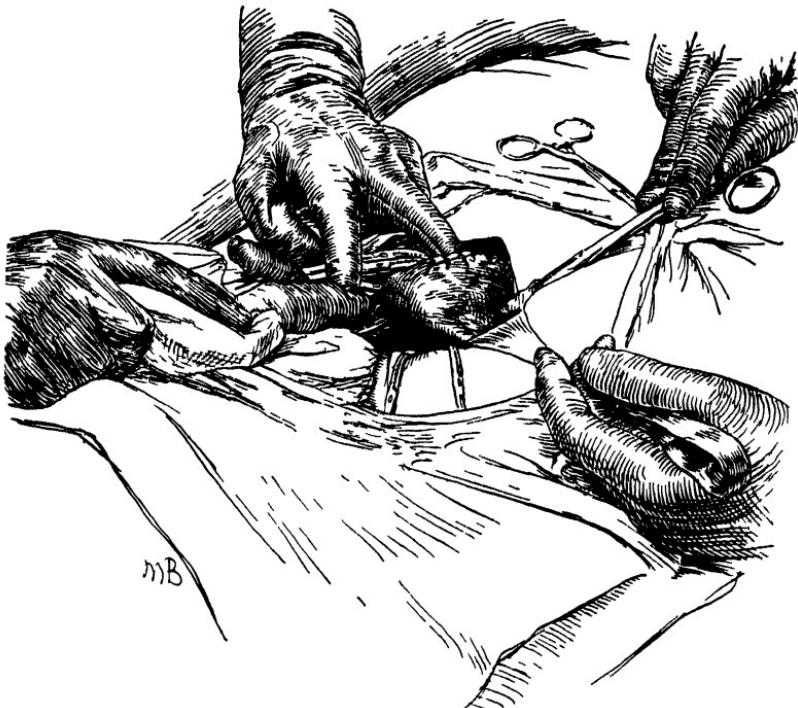
Fig. 39.—The tumor shown in figure 38 has been removed from the posterior surface of the uterus. Such an operation is known as a myomectomy. The sutures can be seen which reunite the cut posterior surface of the uterus. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

panhysterectomy can be carried out without any delay during the operation.

A lower abdominal midline incision is better suited for gynecological surgery than one made through either the right or left rectus muscle. While the transverse incision made just below the level of the pubic hair, the so-called Pfannenstiel incision, may give sufficient exposure for a simple uterine suspension it should in our opinion never be used for hysterectomies. The incision should be of sufficient length to enable the operator to obtain good exposure of the pelvic structures and to perform the operation easily. To lengthen an incision as much as is neces-

sary does no harm, while in operations performed through a small surgical field serious injuries to the bladder, ureters, or large blood vessels may occur.

It is important in performing any pelvic operation that the intestines be carefully packed away from the pelvis with gauze pads which have been soaked in warm salt solution. If the pads are well placed the small intestines should not come into view during the operation. There should be a clamp or metal ring attached to the end of each of these pads so that there will be no chance of a pad being lost and left in the abdominal cavity. In some operating rooms it is the custom to count every piece of gauze, including the sponges and pads, before and after an operation, but we feel it is equally safe simply to insist on no loose gauze being used during an operation, except before the peritoneal cavity is opened and after it is closed. This is done by using only sponges that are on metal sponge sticks and, as has already been said, by placing on the gauze pads clamps or metal rings which always remain away from the incision itself.

There are several methods of performing a *supravaginal hysterectomy* which differ from each other in certain details but they all include the following important steps.

1. The ligaments which hold the uterus in place are cut and tied.
2. The so-called cardinal vessels which supply the blood to the uterus are ligated. These are the two uterine arteries and the branches going to the uterus from the ovarian arteries.
3. The peritoneal reflexion of the bladder is detached from the anterior surface of the uterus.
4. After the uterus has been removed the cut ends of the ligaments are sutured back to the cervical stump so as to prevent a prolapse of the cervix.
5. The cut edges of the peritoneum are united and in this

way the pelvis is re-covered with peritoneum and a smooth surface left so that there will be very little likelihood of postoperative adhesions developing.

**In a panhysterectomy** the entire bladder, not just its peritoneal reflexion, is detached from the anterior surface of the uterus and the uterine arteries are tied at a lower level than they are in a partial hysterectomy. Accordingly, there is much more danger of the operator injuring a ureter when the entire uterus is removed and hence greater care must be exercised in applying hemostats. No drainage is required after a supravaginal hysterectomy but most gynecologists after a panhysterectomy drain the peritoneal cavity by a cigarette drain which passes through the vaginal cuff into the vagina and to the outside.

It may seem that the technique of hysterectomy has been described in greater detail than is necessary in a book of this type but this has been done deliberately because, as has already been said, a hysterectomy is the major operation which is carried out most often by the gynecologist. The other gynecological operations will be described more briefly.

**Salpingectomy** means the removal of one of the fallopian tubes. When both are removed the operation is called a bilateral salpingectomy. In performing a salpingectomy it is important to remove the entire tube, including the part of it which traverses the uterine cornu. After a tube is removed the remaining raw area is closed over by sewing the round ligament on that side to the posterior surface of the uterus. The principal indications for a salpingectomy are salpingitis due to gonorrheal, tuberculous, or streptococcal infections, and tubal pregnancies.

The removal of an ovary is an **oophorectomy** and when all of the pelvic organs must be sacrificed the patient is said to have had a hysterectomy and double salpingo-
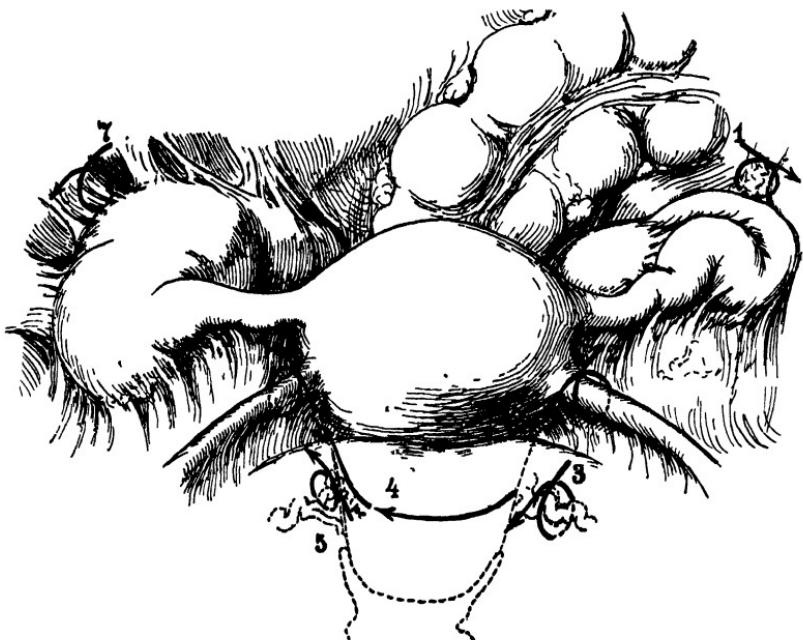
FIG. 40.—This patient had bilateral gonorrheal tubo-ovarian abscesses. It was necessary to remove the uterus, both fallopian tubes, and the ovaries. This drawing shows the ovarian vessels being ligated (figures 1 and 7) the round ligaments (figures 2 and 6) and the uterine vessels (figures 3 and 5). Figure 4 shows the point to which the peritoneal reflexion of the bladder was dissected down from the uterus before the uterine vessels were tied. A supravaginal or partial hysterectomy was performed. The cervix was not removed. (Kelly, Howard A. *Operative Gynecology*. D. Appleton Company.)

oophorectomy. Ovaries are removed because of cystic formation, inflammation secondary to salpingitis, and tumors, both benign and malignant.

A **curettage** is a minor operation performed to secure tissue from the body of the uterus and the cervix so that microscopic studies of this tissue can be made. The operation is carried out through the vagina. Usually the patient is anesthetized and the cervix dilated before a curettage is carried out, but a so-called *suction curettage* can be carried out in a doctor's office or dispensary without anesthesia. Most gynecologists, however, do not feel that

a suction curettage is entirely reliable as a means of recognizing or excluding the presence of an early uterine malignancy. A *dilatation of the cervix* is itself of value in cases of dysmenorrhea due to cervical stenosis or to acute anteflexion of the body of the uterus on the cervix.

A **perineorrhaphy** is an operation to correct a relaxed perineum. With this condition many patients have some prolapse of the rectum into the lower part of the vagina and they are then said to have a rectocele. A perineorrhaphy is also called a posterior colporrhaphy or sometimes simply a posterior repair. The most important step in this operation is to reunite the levator ani muscles which have been torn at childbirth. Excision of the excess mucous membrane combined with a plastic operation which restores the vaginal outlet to its original condition does away with the abnormal appearance of a torn outlet, but it is the reuniting of the levator ani muscles and the fascia surrounding them that relieves the patient's symptoms.

When the supporting structures of the anterior wall of the vagina are torn, the bladder prolapses and the patient is said to have a cystocele. The operation to correct this condition is known as *anterior colporrhaphy* or an anterior repair. The important steps in the operation are replacing the bladder in the position from which it has fallen and holding it there by uniting under it the pubocervical ligaments.

*Trachelorrhaphy* is the name applied to the plastic operation by which a torn cervix is corrected. The everted infected edges of the torn portions of the cervix are removed and the freshened edges united. Sometimes this operation is called a *tracheloplasty* instead of a trachelorrhaphy. A special type of plastic operation on the cervix is known as the *Sturmdorf operation*. It is very effective when used in properly selected cases.

An *amputation of the cervix* is an operation that

twenty years ago was often performed especially in cases of marked endocervicitis. Gynecologists have, however, learned through experience that the cervix should never be amputated when a woman is in the childbearing age for, if she becomes pregnant after such an operation, she will probably either abort or have a very difficult labor.

For complete prolapse of the uterus two operations are used, the *vaginal hysterectomy* and the *interposition operation* which is also known as a vaginal fixation. In some clinics gynecologists prefer to remove the uterus in these cases, but in Baltimore at both the Johns Hopkins Hospital and the University Hospital, the interposition operation is preferred. It is the less shocking procedure of the two and in our hands has yielded excellent results.

In cases of pelvic abscess an incision is made in the upper part of the vaginal wall, immediately behind the cervix, through which a clamp is inserted into that lower part of the peritoneal cavity, known as the cul-de-sac of Douglas. This is the operation of *pelvic puncture* or *posterior colpotomy.* In carrying out this procedure the operator must be careful that his clamp does not go too far laterally or he may injure a ureter or one of the vaginal veins.

Occasionally the term *hysteropexy* is applied to the procedure by which a retroposition of the uterus is corrected surgically but most gynecologists speak of this operation simply as a *suspension of the uterus.* They are, however, apt to indicate what type of operation is carried out. Many different varieties of suspensions have been developed and most of them bear the name of some gynecologist. For instance, there is a Coffey and a Baldy-Webster suspension, but in Baltimore most gynecologists prefer the modified Gilliam method in which the uterus is held forward by sewing the round ligaments to the sheath of the rectus muscles and thus shortening them. In general the various types of round ligament suspen-
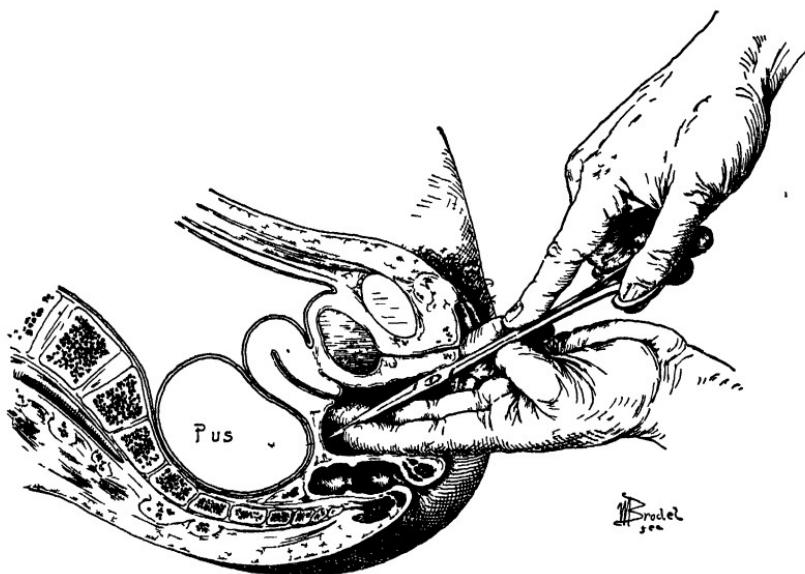
FIG. 41.—Puncturing a pelvic abscess. An abscess started in the fallopian tubes, extended downward into the bottom of the peritoneal cavity, known as the cul-de-sac of Douglas, and finally caused bulging of the vaginal wall behind the cervix. The surgeon is about to incise the posterior vaginal wall and drain the abscess through the vagina. It is possible to do this as only a small layer of tissue separates the upper part of the vagina and the peritoneal cavity. This operation is sometimes spoken of as a posterior colpotomy but more often as simply a pelvic puncture. It is often a life-saving procedure. (Kelly, Howard A. *Gynecology*. D. Appleton Company.)

sions differ merely in the way that the ligaments are shortened and most of the suspensions are round ligament suspensions. The Coffey operation is an exception to this rule as its essential feature is the plication of the broad ligaments in front of the uterus.

# THE EQUIPMENT AND SUPPLIES IN THE GYNECOLOGICAL OPERATING ROOM

The care of the general equipment in the operating room and the supervision of the preparation and sterilization of surgical supplies are only a few of the many duties of a head nurse in the operating room. These responsibilities she must of necessity share with those in the nursing staff under her, including both the graduate and pupil nurses.

In fact, whether or not an operating room is a smoothly running establishment depends not only on the work of the doctors and nurses but also on that of the maids and orderlies. Cleanliness of the entire suite is, of course, a prime factor in this work. A dependable person can be relied upon to carry her share of responsibility and with a reasonable amount of supervision keep the equipment spotless. This can be accomplished only when each individual working in the operating suite is made to realize that his or her work is as important as any other part of the routine and that his support is needed.

The operating room should be large, especially in a teaching unit, well ventilated and lighter, and if possible air-conditioned. A control system should maintain the humidity at 55 per cent as this state of humidity lessens the chance of anesthetic explosion. The walls and floors

should be tiled to facilitate easy cleaning. Electric lights should be of the ceiling and floor varieties, the number of each depending upon the individual needs of the particular operating room. However, clear focusing and adjusting are important considerations in any instance.

The operating table itself should be so made that it can be raised and lowered easily and so that the head of the table can be dropped in such a way as to place the patient in the Trendelenburg position. Many excellent styles of operating tables are now on the market and every year improvements are being devised which make these tables more serviceable.

Equipment such as the autoclave and sterilizers will vary according to the amount and type of work done in the individual operating room. Except in the smaller operating units they are usually found outside of the operating room itself. Cotton materials, solutions, rubber gloves, and other supplies that can not be boiled must be sterilized by autoclaving under pressure and indeed in some hospitals instruments and enamelware are prepared in this manner. However, in the majority of operating rooms instruments and enamelware are still sterilized by boiling, and when this is done a large steam sterilizer is needed.

The types of sinks that should be installed will also vary according to the purposes for which they are to be used. Those for actual preoperative scrubbing of the hands and arms should be deep, foot- or knee-controlled, and widely spaced. The shallow sink is ideal for rinsing instruments and eliminates the lifting of heavy trays to unnecessary levels. General utility sinks should be deep to prevent splashing and adequate in size to contain enamel floor basins, service cans and so forth. Most of the sinks should be placed in adjoining rooms outside of the operating room itself.

Cabinets and cupboards should be adequate for the de-

partment needs. Instruments are usually kept in cabinets with glass shelves so the articles can be easily seen through one shelf to the other without losing time. If kept in units, according to their use, they can be more easily assembled. This is especially helpful when it is essential to prepare rapidly for an emergency operation. Rubber goods, such as tubing, catheters, and bougies, can be quickly found if kept in drawers or compartments labeled to show their size.

Equipment in the operating room itself usually includes the following:

1. A large instrument table, either semicircular or oblong.
2. A Mayo stand, which is really a small instrument table.
3. A surgical stand, if the room does not provide built-in glass cupboards for storing extra supplies and special equipment.
4. A table for the use of the anesthetist.
5. A clean-up table.

In some operating rooms there is a special small table covered with an enamel tray on which specimens are placed when they are removed at operation. The lower shelf of this table contains specimen bottles of various sizes, a solution used for fixing specimens for microscopic study and other articles necessary for labeling specimens and cultures.

The surgical stand has on its shelves a supply of the most common articles used. Its inventory includes the various sizes and types of catgut, solutions, medications, needles, and packages of different kinds of sterile gauze and drains. If all of these articles are kept in the same position on the shelves, a nurse can easily learn where they are and can quickly secure and replenish supplies for the scrub nurse when needed. The inventory of this stand is checked daily, resterilized when necessary and
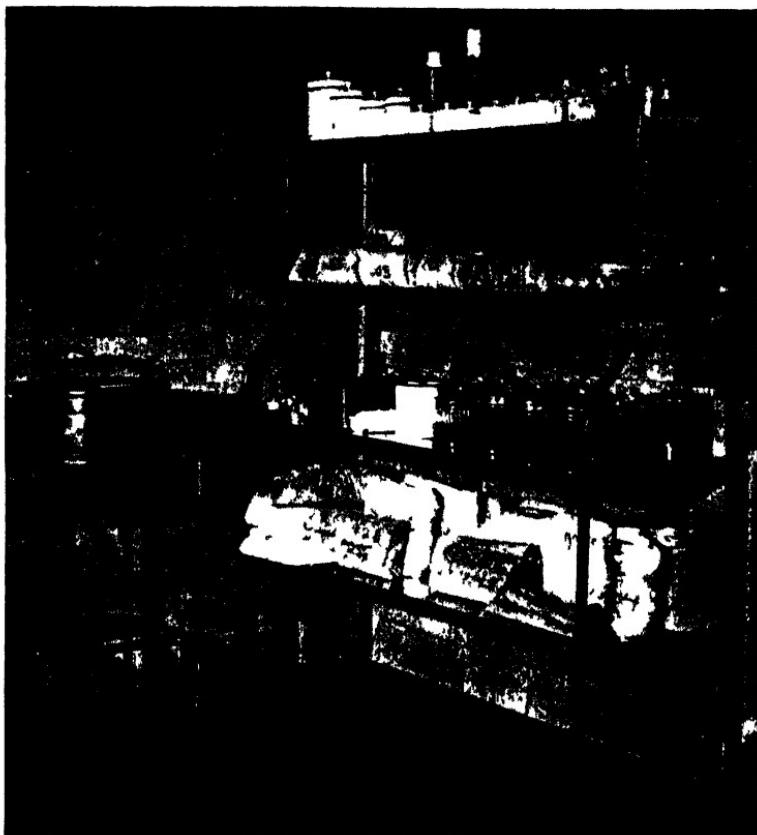
Fig. 42.—A corner of the operating room. The surgical stand shown in the picture is a large fixture which holds extra supplies and equipment. Beside it are some drums in which operating-room gowns have been sterilized. A nurse or a doctor pushes on the foot pedal which raises the lid of the drum and then a sterile gown can easily be taken out.

always brought to the standard number every afternoon. The purpose of this stand is to facilitate quick work and eliminate trips to the supply-room during operations when the circulating nurse should not have to leave the room.

The *anesthetic table* has two shelves. On the upper are inkwells, containing red, blue, and black ink, penhold-

ers, a hand blotter, cans of ether, a large bowl, containing unsterile sponges, and a small dropper bottle of castor oil, a little of which is often dropped into the patient's eyes to prevent ether burns of the conjunctiva. A stethoscope hangs on the side of the anesthetic table. The bottom shelf has a flashlight, a curved basin, a wooden mouth-gag, forceps with sea sponges, a rubber mouth-gag, a small rubber nasal catheter for suction, an airway, and an ether mask. Nearby is the electric suction apparatus used to prevent aspiration of mucus.

The *clean-up table* has two shelves. On the upper are kept the following:

> iodine in benzene, 1-1000
> iodine, 3½ per cent
> iodine, 7 per cent
> ether
> alcohol
> green soap
> sterile flask of water
> sterile flask of 1-1000 bichloride of mercury
> glass bowl with safety pins
> large glass dish filled with unsterile sponges
> straight razor
> enamel can with sterile large sponges
> enamel can with sterile small sponges
> conical glass with sterile forceps and sponge sticks
> sterile catheter bowl and a sterile catheter

On the lower shelf of the clean-up table are stored the following articles:

> woolen blanket folded in sheet
> unsterile cotton pads
> unsterile towels
> caps and masks
> rubber aprons
> box of examining gloves

The clean-up table which we have just described is the one in the operating room. As sometimes the vaginal clean-up is carried out in the anesthetic room outside of the operating room there is, of course, a second clean-up table in the anesthetic room.

Twenty-five years ago, many hospitals prepared and sterilized at least a part of the catgut which they used. Today, practically all catgut is bought from the manufacturers already sterilized, but it is still the duty of the operating-room nurse to supervise the sterilizing of the glass tubes in which the catgut comes. The way that this is done depends on whether the hospital uses boilable or nonboilable catgut for both types are sold. If boilable catgut is preferred, the glass tubes containing it are sterilized by boiling for ten minutes or autoclaving for from twenty to thirty minutes and then covering the tubes with an antiseptic solution. On the other hand when the nonboilable variety of catgut is used the tubes are sterilized by soaking them in a germicidal solution for twelve hours and then transferring them to a previously autoclaved jar filled with another antiseptic solution.

Catgut comes in many sizes from the very fine triple zero to the so-called number three size, which has a diameter almost equal to that of ordinary twine. All these sizes can be obtained in both plain and chromicized catgut. In general, fine plain catgut, such as zero or double zero, is used for tying the small vessels in the subcutaneous fat, while considerably larger and usually chromicized catgut is asked for by the surgeon when he is sewing together the fascia after a lower midline incision.

It is one of the duties of the nurses in the operating room to see to it that the instruments are kept in good condition and this means constantly inspecting them. However, the preparation of gauze, linen, towels, dressings, and gowns takes more of the nurse's time than does the supervision of instruments.

**The careful preparation and sterilization of supplies is necessary for successful operative work.** Muslin and gauze are the materials used most extensively in making supplies. The best grades of muslin and sheeting, while being more in initial cost, are really the cheapest, as both will stand many washings and resterilizations before showing any signs of wear.

The care and folding of linen is most important. Every piece of linen returned from the laundry to the operating room must be carefully inspected for holes or any tiny foreign bodies, such as hairs, pins, and loose threads, that can adhere during the process of washing. When holes are found they are marked and sent to the linen room for repair.

Each institution has its own type of linen and its methods of folding it. In general use, however, are table and basin covers, towels, laparotomy and perineal or vaginal sheets, gauze sponges, packs and gowns. Considering each of those mentioned individually, we usually find table covers made of two or three thicknesses of heavy muslin or sheeting. They should be of adequate size to cover and drop over the edges of the operating table. Basin covers and table towels are usually of only one thickness of muslin. Laparotomy sheets should be large enough to cover completely the patient and operating table, thus insuring a sterile field throughout the operation. They are made of double thickness of muslin, three and a half yards long and seventy-two inches wide. The center has an eight- by twelve-inch hole reinforced by a four-inch facing to prevent tearing.

The perineal or vaginal sheet is used to drape the patient for a vaginal operation. This article is an operating sheet and leggins combined, large enough to slip over the patient's feet and legs when supported by stirrups. There is an opening in the center, four inches wide and seven inches long, faced all around to prevent tearing.

Gauze is used for spongès, packs, and drains. These vary according to the type of operation for which they are used. Gauze can be purchased in all grades, from closely woven bunting to loose and coarsely joined threads. In any event its property to absorb moisture is greater than that of any other material used in operating-room work. A number of gauze supplies can now be purchased ready-made, including perineal pads and abdominal packs and sponges. Gowns are made of heavy muslin, in many sizes and types, with or without webbing cuffs.

Two other important articles used in operating-room work are caps and masks. It is necessary for nurses to cover their hair entirely when working in the operating room. Many varieties of caps are satisfactory. They can be purchased or easily made. The helmet shown in the figure 43 has proved satisfactory and is comfortable to wear. Doctors' caps are usually made of twill or muslin and are easily adjusted. Face masks are made from four thicknesses of butter-cloth and are taped at each corner. One pair of tapes ties at the top of the head, the other at the back of the neck. If a small pleat is stitched into each side of the mask it will be more comfortable to wear.

In order to facilitate accuracy and speed certain articles are sterilized in groups which when opened will meet all the demands of a particular operation. Either muslin wrappers made of double thickness muslin and stitched securely together or drums, which are metal containers large enough to hold all the linen necessary for a major operation, may be used. Paper covers have been found satisfactory in some institutions. They are employed mostly to wrap small supplies which are to be used later as surgical dressings on the wards. In most institutions gowns are packed in muslin wrappers.

For an abdominal operation the following articles are packed together.

1 instrument pad
1 abdominal sheet
·1 package folded large sponges
1 package small sponges
1 instrument stand cover
1 table towel
20 absorbent towels

6 ·abdominal gauze packs 36 x 8 inches
5 abdominal pads 8 x 8 inches
5 abdominal pads 8 x 4 inches
2 gauze fluffs for covering incision

For a vaginal operation the following articles are packed together.

1 vaginal sheet
1 vaginal towel
1 plain absorbent towel

1 package open sponges
1 instrument pad

All these supplies are autoclaved by steam under 20 lbs. pressure for sixty minutes at a temperature of 260°F.

A large supply of sterilized articles is kept in the supply-room of the operating room suite. They are stored on labeled shelves ready for immediate use. Besides linens and gauze packages, there are brushes, washcloths, sea sponges, ointments, solutions, culture tubes, and enamelware. All of these articles are placed on the shelves according to their dates, the oldest being removed first. All articles, if not used within fourteen days, are resterilized.

A satisfactory method of sterilizing knife blades and surgical needles is in a pressure cooker. These articles are sterilized for thirty minutes after they have been placed in a small enamel jar and immersed in sterile white oil. This does not dull the blades of the knives and also preserves the needles, both in sharpness and appearance.

Rubber gloves are washed carefully in warm soapy water after they are used. They are tested with water before being boiled, the damaged ones being kept separate from the perfect ones. After boiling for a designated period of time they are hung on racks to dry and when

dried, retested, mended if necessary, and powdered. The gloves are then mated according to size and durability and the cuffs turned back. They are then placed in numbered wrappers, palm side up, and thumbs toward the center, with a small envelope of previously sterilized powder in one cuff. (Because of the density of the talcum powder it must be autoclaved once for thirty minutes, before being run with the gloves.) The wrappers containing the gloves are placed on edge in a tray and are autoclaved for fifteen minutes under 18 lbs. pressure at a temperature of 250°F. When cool they are dated and replaced on the shelves.

# THE STUDENT NURSE IN THE
# OPERATING ROOM

A general discourse on operating-room work seems imperative if the student nurse is to render efficient service while she is a member of the operating team. From the moment of her arrival until she leaves, a nurse's work in the operating room differs markedly from that which she has done in any other part of the hospital. The ever-present fear, dread, and nervous tension should be allayed as quickly as possible by the operating-room supervisor or the person responsible for her training.

**Health and intelligence are essential to an operating-room nurse.** Only those with good physical endurance are capable of doing, for a continued period of time, the kind of work she is expected to do. To maintain a high standard of work while living behind a mask, day in and day out, in the overheated moist atmosphere demands good personal hygiene both on and off duty.

To make the student's work more interesting and impress on her the importance of exactness, she should be shown how to do each piece of work and the reason for doing it in such manner. Conscientiousness, reliability, and accuracy are all requirements of a good operating-room nurse. It is well for all those working in a surgical

unit to realize that any one of them may suddenly become ill and be the next patient on the table. A good rule to remember is this, never use anything on anybody else you would not want used on yourself.

While working in the operating room, a nurse wears a uniform made with short sleeves and low neck and of sufficient size to facilitate quick movement. The hair should be entirely covered by a close-fitting cap made of some light-weight material. Jewelry is never worn on the hands or arms. Lipstick and face rouge are not permitted as they stain the face masks.

After spending some time in receiving patients, watching anesthesia administered, and helping with clean-ups in the anesthetic room the student is then ready to learn to be a utility or circulating nurse in the operating room itself. Such a nurse is one who is not scrubbed and working on the operating team, but instead is free to circulate to all parts of the room. Her duties are many and vary according to the type of operation being performed. She must be thoroughly familiar with the operating-room equipment and know just where extra supplies are stored so that no time is lost in replenishing materials. Moreover, a good utility nurse is able to recognize at once the needs of the nurse who is cleaned up and helping on the operating team. To be quick as well as quiet is necessary but to be accurate is more important. Many minutes are lost when haste causes a break in technique. Moreover, a breach in technique contaminates the whole set-up and endangers the life of the patient. Honesty, one of the most essential qualities in a nurse, must be emphasized at this point. Do not be afraid to acknowledge a break in technique when you have made one. Be willing to admit defeat; learn and profit by the experience.

The student nurse is taught to carry sterile articles with sponge-sticks, always keeping the tip of the sponge-stick down so that none of the solution from the container

from which it has been taken will run down on her hand. Never should she reach over a sterile field. When an article is to be placed on a sterile table it should be held at least four inches high. If it must be laid on a table that is in use, the sponge-stick or lifter must be reboiled before being placed in the sponge jar. Articles are given to the scrub or clean nurse from the back of the sterile table, never from the front.

When replacing a sponge-stick into its container, care must be exercised that it does not touch the edge of the container but goes directly into the center of the solution. If there is the slightest doubt or question of contamination reboil at once. When doubt exists there is usually error.

Small jars of supplies are taken to the sterile table before being opened. The lid is removed between two fingers of the left hand, then the jar is set on the palm of the left hand while the contents are removed with a sponge-stick. Holding the lid in this way prevents dust or other unsterile particles from settling on the under side.

Flasks are grasped near the base of the stem when pouring solutions on a sterile field. This guards against the solution running on the nurse's hand and dripping in turn on the sterile field.

When using a stock bottle of medicine a few drops are poured over the edge before any of the solution is poured into a sterile cup or on a sponge. This is an added precaution against dust particles which might be present on the edge of the bottle. This guard against contamination is not necessary when the top edge of the bottle or flask is itself sterile and covered with a sterile top.

When a sterile bowl containing a catheter ready for use is passed to a doctor the bowl is picked up on the outside, thus eliminating the possibility of contamination.

There are other instructions, too many to mention, that

are given the student as she learns about her work in the operating room. She gradually assimilates them all until she becomes a capable, experienced person who is very helpful in the operating room and upon whom rests a large part of the responsibility for the success of an operation.

After a student has learned to circulate in the operating room she is then ready to clean up and become part of the operating team. Her duties as a scrub or clean nurse vary in different hospitals. In most of the larger clinics she has charge of the instrument table, arranging the various types of instruments and gauze packs so that they can be given to the operator and his assistant as they are needed and without a moment's loss of time. An experienced operating-room nurse often learns to anticipate a surgeon's wants to such an extent that it almost seems as though the operator was having placed in his hands the instruments that she thinks he should be using at that moment. The student nurse is given a complete lesson in scrubbing for an operation and setting up a sterile table.

**There are several satisfactory ways of preparing the hands and arms for work on the operating team.** The ultimate aim of all is to render the skin as clean as possible. This is done by scrubbing with brushes and using a solution of surgical soap for a period varying in different institutions from five to ten minutes. The hands are then immersed in an antiseptic solution before the gown and gloves are put on. Typewritten directions for scrubbing-up are placed over the sinks in all of the clean-up rooms and each person is asked to carry out the entire procedure.

When the scrub routine is finished the hands are dried on a small sterile towel, handed with a sterile sponge-stick by the utility nurse. Next a gown, folded properly before sterilization, is given to the one who has scrubbed. The arms are thrust through the sleeves and the gown

adjusted from the back, buttoned and tied in place by the utility nurse. It should be emphasized at this point that the back of the gown is not sterile and therefore each member of the operating team must take care not to touch the back of anyone else. After the gown is on, the hands are powdered. The first glove is handed so the receiver can grasp it by the top of the turned-back cuff. The second is given so the fingers of the already gloved hand can slip under the cuff, thus holding the glove until the hand is put into it. In this way the bare hands never touch the outside of the gloves. After one nurse has been gloved she can help the rest of the operating team by holding and spreading their gloves so that they can insert their hands directly into them.

The nurse is now ready to arrange a sterile instrument table. If an abdominal operation has been posted, a large instrument table is used but if only some minor gynecological operative procedure, such as a dilatation and curettage, has been scheduled a smaller table is prepared.

The utility nurse drops back the wrappers of the instrument table cover and then the clean nurse opens the cover, keeping her hands on the inside of the folds. She then obtains the contents of an ''abdominal set'' which, as stated before, contains all the linen, towels, and gauze needed for a major case. Enamelware and supplies, including knife blades, needles, silk, and catgut, are put on the table as needed.

When sterile packages are opened each wrapper is completely undone so that the contents are easily grasped by the scrub nurse with the minimal chance of contamination. Whatever type of article is asked for, whether it be cotton materials or enamelware, the wrapper should be opened by the first fold away from the individual holding the package. In this way the contents are protected until the last fold is removed and the scrub nurse receives it.

Fig. 43.—Ready for the surgeon to start. The patient is anesthetized. Her abdomen has been cleaned up and the operative field draped. On one end of the instrument table the gauze sponges and packs have been arranged. At the other end are the sutures and needles. Most of the instruments are in the tray in the center of the table. There is a special place for each type of instrument. The Mayo stand has been slid over the foot of the operating-table and on it are placed the instruments that are used constantly. The nurse is holding in her right hand the scalpel which she is about to hand to the surgeon. In the left hand she holds a hemostat.

The nurse next divides the instrument table into halves by placing the instrument tray pad in the center. On one half of the table the gauze sponges and packs are arranged, on the other the instruments. For every abdominal operation twenty towels are provided. Sometimes one nurse will handle all the sterile supplies but it is not unusual for two nurses to clean up for major operations. In the latter instance, the junior nurse will have charge of the sterile sponges and pads, while the senior nurse will handle the suture material and instruments.

The sponge-and-gauze half of the table is arranged so

that each article is in order, according to the sequence in which it is to be used. A large enamel basin filled with normal salt solution is kept on this table so that sponges and gauze packs may be moistened before they are used. It is kept at the far end of the table so that when it is refilled with fluid there will be less chance of the table being wet. It is customary to use free open dry sponges as the surgeon starts the operation and incises the skin, fat, and fascia. However, the moment the peritoneum is opened all free gauze is taken from the operating table. From then on only gauze sponges that are on sponge-sticks are used and every gauze pad must have a large metal clamp or instrument on it. In this way the possibility of any gauze being left in the peritoneal cavity is eliminated.

It is the duty of the sponge nurse to have the proper gauze pads ready and warmed to the correct temperature and to place moistened sponges on sponge-sticks. She sees to it that there is no free gauze on the operating table while the peritoneal cavity is open. If any gauze protrudes or falls over the edges of the instrument or operating table it must be discarded, as when this happens it is no longer considered sterile. A nurse should be con stantly looking for any break in technique by any member of the operating team.

Catgut is the suture material that is used in largest quantities in a gynecological operation, although some silk and linen are used in most pelvic laparotomies. It is advantageous to soak the boilable type of catgut for a few minutes before it is used, rendering it more pliable and easier to tie. A small enamel bowl filled with sterile water is kept for this purpose. It is not advisable to soak the nonboilable type of catgut.

**The instruments are arranged in definite positions** on the large table so the nurse can place her hand on any instrument as it is called for without losing time hunting

for it. Those that are used constantly are placed on a Mayo stand, which is a small accessory instrument table made to slide over the lower end of the operating table. It facilitates greatly the work of the scrub nurse. There is a special cover for this stand which is so folded before being sterilized that it can easily be slipped into proper position over the metal rack without contamination. A sterile enamel tray is then placed in the pocket provided for it in this cover. The cover is then pulled tight and folded under the tray so as to give a smooth surface on which to place sterile instruments,. sutures, and needles.

In most operating rooms there are printed lists of the instruments that must be assembled and sterilized for different types of cases. The following is a standard abdominal set of instruments.

30 Halsted clamps (Hemostatic forceps)
24 small Kelly clamps
12 large Kelly clamps
24 curved Ochsner clamps
12 straight Ochsner clamps
 4 large towel clips
 4 small towel clips
 8 Allis clamps
 4 Jacobs' vulsellum, straight
 3 straight Mayo scissors
 1 curved Mayo scissors
 3 needle holders
   assorted needles
12 straight Kocher clamps
 3 Kelly bisecting forceps
 1 Cullen uterine elevator
 3 silver spatulae, assorted sizes
 1 tumor screw
 1 packer
 1 uterine sound

 1 probe
 1 grooved director
 2 mosquito clamps
 2 blunt dissectors
 1 spoon
 1 spool silver wire
 1 wire cutters
 1 Edebohl retractor, double-ended
 3 pair abdominal retractors, small, medium, and large
 1 pair Richardson's appendix retractors
 3 pair Halsted's rake retractors, 3-4-6 prong
 1 pair lateral retractors
 3 pair ring forceps
 1 pair Ferguson tissue forceps, 8 in.
 1 pair Ferguson tissue forceps, 6 in.

2 mouse-tooth forceps 1-2 teeth, 5 in.

1 mouse-tooth forceps 1-2, 7 in.

1 thumb forceps, plain

8 sponge-holding forceps, 9 in.

5 sponge-holding forceps, 7 in.

2 knives with detachable blades

This perhaps seems like a large number of instruments and doubtless in many hospitals the list is smaller. However, it is better to have ready all the instruments that an operator may ask for rather than for him to have to wait in the midst of an operation until some instrument is taken from the instrument cabinet and boiled. It is true that in some instances only a few instruments of a routine type are necessary but in a difficult case some one special instrument may be just what the surgeon needs to carry out a step in the operation.

For a vaginal plastic operation, such as a cystocele, rectocele, or interposition operation, the instrument tray will contain the following articles.

1 pair finger retractors

1 pair small lateral retractors

1 posterior vaginal retractor

1 anterior vaginal retractor

3 Hegar uterine dilators No. 5 to 10 inclusive

2 Goodell uterine dilators, large and small

1 probe

1 packer

1 uterine sound

3 Kelly serrated curettes, large, medium, and small

1 tenaculum

4 Jacobs' vulsellum, straight

12 Allis clamps

12 Kocher clamps, straight

12 Halsted clamps

12 small Kelly clamps

6 straight Ochsner clamps

6 curved Ochsner clamps

6 large Kelly clamps

2 straight Mayo scissors

1 curved Mayo scissors

2 Emmett scissors, right and left

2 mouse-tooth forceps, 1-2 teeth, 5½ in.

1 plain tissue forceps, 5½ in.

1 Ferguson tissue forceps, 6 in.

3 needle holders assorted needles

2 knives with detachable blades

1 glass catheter

1 medicine glass

1 Chetwood syringe

1 specimen bottle

If a vaginal hysterectomy is contemplated a few more strong hemostats, such as Ochsner clamps, will be added but otherwise the above list will suffice.

When a diagnostic curettage is to be performed one need get ready only a few instruments. The following will be sufficient.

1 anterior vaginal retractor

1 posterior vaginal retractor

1 Jacobs' vulsellum

1 tenaculum

1 large Kelly clamp

3 Hegar uterine dilators
  No. 5 to 10 inclusive

2 Goodell uterine dilators, large and small

3 Kelly serrated curettes, small, medium, and large

1 probe

1 packer

1 uterine sound

1 spoon

1 specimen bottle

One might present detailed lists of the instruments needed for every possible gynecological operation but those shown in the above lists indicate in a general way what instruments the nurse is expected to have ready for the operations that are being done every day in a gynecological operating room.

A final word might be said about a nurse's deportment in an operating suite. When she first enters she is apt to be a little shy and frightened. This is natural but should soon be overcome as part of the nurse's duty is to instill confidence into the patients who come to the operating room. When the student nurse becomes accustomed to the operating room she must be careful not to go to the other extreme and fail to appreciate just how serious a place an operating room is. Most patients waiting for an operation welcome a few words of encouragement from nurses and doctors and some will even joke while they are waiting to be anesthetized. Patients do not

resent cheerful or even amusing remarks so long as they are made to the patient. What many of them do dislike is for nurses and doctors to be talking together in their presence about things that do not concern them. Never forget, as Lord Moynihan of Leeds wrote, "the patient is the only important person in the operating room."

# POSTOPERATIVE TREATMENT

The successful outcome of an operation depends largely on the **postoperative care.** This should start the moment that the woman leaves the operating room and continue until she has been completely restored to health. The importance of a nurse's role during all this time cannot be overestimated as the efforts of the most skillful surgeon may be ruined through careless nursing and postoperative observation.

After the patient has been lifted from the operating table on to a stretcher, she is taken in most hospitals to a room outside of the operating room before she starts on her journey back to her ward. Here all patients who have been catheterized before operation receive a bladder instillation usually consisting of 30 cc. (one ounce) of .5 per cent mercurochrome. This acts as an antiseptic and also as a mild irritant causing the patient to void.

In many cases a rectal instillation is given at the same time, consisting of 1000 cc. (one quart) of 2 per cent sodium bicarbonate solution to which 60 cc. (two ounces) of white oil have been added. This large rectal instillation should be heated to a temperature of 110°F. and given immediately after the operation is completed, preferably in the operating suite. In this way a large amount of fluid is introduced and retained in the large intestine. Renal

secretion is stimulated and this in itself is apt to cause the patient to empty her bladder spontaneously. Moreover the alkaline content of the fluid combats an acidosis, while the oil keeps the colon lubricated and promotes early evacuation of the bowels.

After these immediate postoperative treatments the patient is transferred to a stretcher where a scultetus binder, made of canton flannel, and a perineal pad are adjusted. She is carefully and securely covered with warm woolen blankets, strapped loosely, and returned to her bed.

It is the responsibility of the nurse giving the postoperative treatments to notify the floor head nurse of the patient's return. This is an important consideration, aiding the nursing staff on the floor in giving proper postoperative care. The maintenance of body heat is of great importance. Special care must be taken to prevent the patient becoming chilled while being transported through the hospital corridors.

While the patient is in the operating room the nurse prepares the bed for her return. This special preparation is called an operation or **ether bed.** The bed must be stripped and the mattress turned, because it will be some days before this can be done again. Fresh clean linen is used. Both rubber and muslin drawsheets are placed and the space above these is covered with a small dressing-rubber and towel. These are placed to overlap the drawsheet about one inch and are pinned in place carefully to avoid piercing the rubber. A woolen blanket is placed next with the top edge six inches from the head of the mattress. The side away from the door is folded up even with the edge of the mattress. The top sheet, blanket, and spread are then placed and folded at the top as usual. The foot and side nearest the door is folded even with the mattress, and the side away from the door is tucked securely under the mattress. A hot-water bottle is placed in

the bed and an extra gown over that. When the patient returns, the covers are easily rolled to one side while she is being lifted into bed. The warm gown is put on and the woolen blanket tucked tightly around her. The hot-water bottle is removed.

**Position in bed.**—Until the patient has fully regained consciousness her head should be kept low. If she vomits the head should be turned to the side so the vomitus will run out of the mouth by gravity and not back into the larynx. If she is shocked the surgeon usually orders the foot of the bed to be raised 18 inches. This lowers the patient's head so that the blood from the extremities returns more easily to the heart and brain. This is the so-called shock position, usually attained by putting blocks or a chair under the foot of the bed.

After the patient has recovered from the anesthetic she is usually allowed to lie on either side or on her back. For the first few days she may be helped by the nurse to turn but the sooner she is able to turn herself the better. In this way the chances of developing hypostatic pneumonia are lessened. If there is any pelvic peritonitis or any other reason for drainage, the patient is put in Fowler's position as soon as her general condition, as shown by the pulse and blood pressure, will permit. Indeed many patients find that they are more comfortable sitting up in a modified Fowler's position with the knees flexed and the back slightly elevated. However, it is not wise to leave the patient in any one position for a long period of time. By making the patient fully extend and flex her limbs a few times every hour the danger of phlebitis developing in the lower extremities is lessened.

The nurse must record the pulse, temperature, and respiration at frequent intervals during the first few hours after the patient returns from the operating room. The pulse is sometimes weak and accelerated at the end of a difficult operation and after the patient returns to

her bed it is of great importance that the surgeon know whether the heart action is improving or weakening. It is the nurse's duty to keep the doctor in charge informed about this. Especially important it is to note and immediately report to the physician whenever a pulse that has been slow and sustained suddenly becomes weak and rapid. Such a change may be the first indication that an internal hemorrhage is taking place.

**Postoperative orders** are in most instances merely the recording of routine measures. It is essential that a nurse be thoroughly familiar with the routine of the hospital in which she is working. However, she must not be so stunted by any particular ward routine that she cannot understand and proper'y carry out unusual orders. Different surgeons may get equally good results through methods which seem to differ greatly, and this is something nurses and young doctors sometimes fail to appreciate. Never should a nurse think that simply because a surgeon's work is a little different from that to which she has been accustomed, he is not on that account a competent man.

**Sedatives** are prescribed in order that the patient may be kept quiet and comfortable. In many instances they are of more value than stimulants. Morphine is still probably the ideal narcotic in routine uncomplicated cases. It should be prescribed by the doctor in sufficiently large doses to give results. Pain in itself wears the patient down and if it is severe enough it may jeopardize the patient's chances of recovery. Moreover, it is the function of both nurses and doctors to relieve suffering just as much as it is to restore the sick to health. When a patient's condition is serious, stimulants are prescribed.

**Fluids by mouth** are usually allowed as soon as the patient is conscious and nausea has ceased, except after operations on the stomach and intestines. In some hospitals crushed ice is first given, in others it is felt that

warm water in small amounts is better tolerated. After the first day the amount of fluid taken by mouth is increased as rapidly as the patient's condition will permit. A large fluid intake makes the convalescence smoother. Sometimes the patient is unable to take fluids by mouth and then it becomes necessary to give fluids in other ways.

The use of what might be called the **prophylactic rectal instillation,** or large retention enema, has already been described as one of the measures carried out in the surgical suite as soon as an operation is complete and when given at this time it is very helpful. However, the giving of fluids by rectum or by subcutaneous infusion to patients who have returned to the ward has been largely supplanted by intravenous injections. In fact even in the operating room, when fluids are urgently needed because of shock or hemorrhage, intravenous therapy is indicated. However, a few words will be said about the giving of fluids by rectum and subcutaneous infusion.

The Murphy method of proctoclysis, a continuous rectal drip, is still in vogue in some hospitals but unless carefully watched it does not work satisfactorily. However, sometimes large amounts of fluid will be taken up by the body tissues by this method. In general the dehydrated patient tolerates and absorbs rectal fluids better than does the woman with normal body fluid content. The rate of flow into the rectum must be carefully regulated so that from 20 to 40 drops a minute are introduced, and as the fluid leaves the tube it should be at a temperature of 115°–118°. Usually normal salt solution (0.9 per cent) or 5 per cent glucose is ordered.

It is a moot question whether better results are obtained by the continuous rectal drip or by the use of repeated small rectal instillations of, for instance, 250 cc. every three or four hours, but there is no doubt that of the two treatments the Murphy method requires more careful nursing. The patient is apt either consciously or

unconsciously to remove the tube with the consequent soaking of the bed, or the tubing may become kinked so that the flow through it is obstructed. Moreover many patients complain about the rectal drip because it necessitates a tube remaining constantly in the lower bowel.

The apparatus necessary to carry out a continuous drip was formerly quite simple, but since Murphy described his original method various modifications of it have been made which, while perhaps increasing the efficiency of the method, necessitate more equipment. Murphy himself used a simple fountain syringe and regulated the flow of fluid through the tube and into the rectum by raising and lowering the container which held the fluid. Usually the container is placed· about ten to twelve inches above the level of the rectal tube and, as has already been mentioned, it is essential that the tube be not twisted or obstructed. It is well occasionally to lower the fluid container below the level of the patient in order to permit the escape of any gas that has collected in the large intestine.

When it is necessary to give fluids more rapidly than is possible by proctoclysis, **subcutaneous infusions of normal salt solution** may be ordered. In some hospitals they are given in the outer side of the thigh, while in others the needle is inserted under the pectoral muscles. If the latter site is used, care must be exercised that the fluid is not injected into the breast tissues. Three thousand cc. of fluid can usually be given by infusion in twenty-four hours and occasionally even larger amounts. It is the nurse's duty to record the rate at which the fluid is being given and the amount of distention of the tissues that occurs. Usually nurses are instructed not to massage the site of the infusion but some surgeons prefer that they do so, in which case extreme gentleness is indicated as otherwise the tissues may be injured and infection develops. One disadvantage of subcutaneous infusion is that no matter whether the needle is inserted in the thigh or under the

breast the distention of tissues caused by the infusion produces considerable discomfort. Then too a patient in shock is apt to absorb a subcutaneous infusion slowly.

Sometimes normal saline (0.85 per cent) is given **in-travenously,** other times a 5 per cent solution of glucose. However, the solution used most often today in many hospitals is a mixture of 500 cc. of normal saline solution and 1000 cc. of 5 per cent glucose. This is an isotonic solution which means that the molecules in the solution are in the same concentration as they are normally found in the blood. Such a solution is therefore much less apt to cause a reaction than is one which contains larger percentages of either saline or glucose. However, a hypertonic salt solution, which is one that contains more than 0.85 per cent salt, is sometimes used in cases of paralytic or adynamic ileus. This condition is one in which the progress of the intestinal contents stops not because of mechanical obstruction but because of paralysis of the intestines. In some instances hypertonic saline does reestablish normal intestinal peristalsis.

Recently a new method of preparing, sterilizing, and giving intravenous fluids has been introduced, which is apparently simpler, safer, and in every way more satisfactory than any of the methods previously used. The flasks which are to hold the solutions are washed with several antiseptics and then thoroughly rinsed with distilled water. In each flask is then placed a hard rubber top with one passageway through it. A metal cap is then placed in the rubber top but is not pushed down tightly into the neck of the bottle. The solutions are then autoclaved for forty-five minutes under 25 pounds of pressure. The autoclaves are then slowly opened and allowed to cool gradually. While the solutions are still boiling, the special metal tops are then pushed down tightly into the neck of the flasks thus producing a vacuum. The special rubber and metal stoppers, the flasks, rubber tubing, and glass-

ware used in this new method of giving fluids intravenously are known as the Fenwal apparatus.

Solutions so prepared remain sterile and ready for use so long as a vacuum remains in the flasks. Before any flask is used a house officer or nurse proves that a vacuum is still present. This is done by merely striking the bottom of the upturned flask with the hand. So long as the vacuum is present a characteristic sound is produced which is spoken of as the water hammer sound. Anybody who has once heard this sound can easily recognize it when he hears it again.

After making certain that a vacuum is present the physician removes the metal top from the flask, thus breaking the vacuum, and inserts a special glass rod which is connected by rubber to a drip tube and thence to a ground-glass adapter and needle. He then turns the flask upside down and suspends it by a kind of wire basket on a metal pole or standard. A small hole in the vent tube which was inserted through the top of the bottle automatically adjusts the pressure and allows the liquid to flow. This hole is then covered with a small piece of adhesive. Special care is taken to see that there is no air in the system. By means of a Hoffman clamp the outflow of fluid is controlled. The use of three-way stopcocks has been discontinued as it was found difficult to clean them properly. The area on the arm (or occasionally on the leg) in which the intravenous injection is to be given is cleaned with iodine and alcohol. The tourniquet is applied to the arm where the injection is to be given. It is removed as soon as it is evident that the vein has been entered.

Solutions of saline or glucose are no longer heated before they are given intravenously, nor is it necessary that blood be warm in giving transfusions. If too much heat is used the blood may be coagulated. Saline and glucose solutions are allowed to run into the vein at a rate of 180 to 200 drops a minute, which means that when an

eighteen-gauge needle is used 1000 cc. of fluid are injected in an hour.

The patient's arm is strapped to a special board and after the needle is inserted she can be satisfactorily watched by a nurse. It is no longer necessary for a doctor to stay with a patient during the whole time that she is receiving fluids intravenously. When all the fluid has been given it is the duty of the nurse to remove the needle and to cover the punctured skin with a small sponge and adhesive. The apparatus is rinsed and stacked on the tray and returned to the central supply-room.

It is not unusual for patients after gynecological operations to have difficulty in emptying the bladder, and repeated catheterizations may be necessary. Most gynecologists feel that cystitis results oftener from over-distention of the bladder and stagnation of the urine than it does from repeated catheterizations. A careful record of fluid intake and urine output helps to show when catheterization is indicated. Some difference of opinion exists as to the length of time patients should be allowed to go without voiding. It is our opinion that if a patient has not voided for eight hours and is in discomfort because of this she should be catheterized at once and even if there is no discomfort the catheterization should not be delayed longer than twelve hours. However, some gynecologists postpone catheterization for longer periods of time, even up to eighteen hours.

If a woman must be repeatedly catheterized she should be given, once a day, a bladder instillation of one ounce of silver nitrate 1-1000. This lessens the likelihood of her developing cystitis. Sometimes the patient will void small amounts of urine at frequent intervals and one may thereby conclude that she is emptying the bladder. Frequently these small voidings may be simply the overflow from a markedly distended bladder. Empirically, we consider that if a patient voids 100 cc. at a time she is probably

emptying her bladder but one must, during the first few days after operation, carefully compare the fluid intake and urinary·output before he can feel confident that there is no urinary retention.

Retention catheters are used by some surgeons in cases of vesicovaginal fistula. So long as they are working properly they obviate the possibility of urinary retention; in fact they keep the bladder empty. However, there is some danger of a retention catheter becoming twisted or clogged, and if one is left in the bladder too long infection is apt to occur and the patient to develop cystitis. Hence, it is well to irrigate the bladder daily through the catheter with 2 per cent boric acid.

Usually a retention catheter is connected by rubber tubing with a bottle tied to the side of the patient's bed, but with a conscious, coöperative patient it is sometimes preferable to have the end of the catheter drain directly into a male urinal. When this is done the urinal must be emptied at regular intervals so that no overflow occurs with the resultant soiling of the bed.

There are several different methods of treating postoperatively the intestinal tract, and sometimes surgeons working in the same hospital have different ideas about this. For example, on the surgical service of one institution castor oil is almost routinely prescribed on the night of the third day and this is followed in the morning by a soapsuds enema, if it is necessary. On the other hand, most of the gynecologists in the same hospital believe that their patients do better if the intestinal tract is treated less drastically and they rely on small water and glycerin enemata and mild cathartics, such as milk of magnesia and mineral oil.

**The care of the perineum after a vaginal operation.—** Some gynecologists think that patients do better if the operative area is left strictly alone and no local treatments are given, but others feel.that perineal irrigations

are of value in treating patients who have had an oper-
ation on the external genitalia, such as a perineal repair
or a vulvectomy.

One of the solutions that is often used as a perineal
irrigation is potassium permanganate in a strength of
1-5000. It not only promotes healing by its antiseptic
action but it also acts as a deodorant. This is important
as some patients have an offensive odor due to sloughing
tissue and discharge from the wound.

**A perineal irrigation** should be given with the patient
flat on her back, knees flexed and separated (not so widely
as to place any strain on the sutures), and her hips on a
douche pan. A dressing towel and rubber may be used
under the douche pan to protect the bed. The covers should
be folded neatly to the foot of the bed, the bath blanket
being used to protect the patient from exposure. A small
sheet, placed diagonally, may be used to drape the lower
extremities, leaving the perineum exposed. A rubber irri-
gation bag, to which is attached approximately five feet
of rubber tubing and a blunt glass nozzle with one hole in
the end, is hung on a pole at the foot of the bed about
twelve inches above the level of the patient's hips. It is
important to hang the bag low in order to avoid too great
a pressure of the solution against the tender area of the
perineum. Usually 1000 cc. of the solution is used at a
temperature of 105° F. A small amount of the solution is
allowed to flow into the douche pan in order to expel any
air and cool fluid from the tubing. The nurse uses finger-
cots on the thumb and forefinger of her left hand for pro-
tection as she separates the labia very gently and very
slightly to irrigate along the suture line. The nozzle
should be held close to the area and moved slowly from
side to side to prevent injuring the tissues or causing the
patient any discomfort. The perineum should be irrigated
from the symphysis downward to avoid carrying any in-
fection from the rectum to the operative area. When all

of the solution has been used the nozzle is detached and carefully dropped into the douche pan. In some hospitals the irrigation bag, rubber tubing and nozzle, and in fact all the equipment, is boiled and absolutely sterile technique maintained, but in other hospitals while cleanliness is stressed this is not thought to be necessary except when irrigations are started immediately after a perineal operation.

After the completion of the treatment the patient should be left clean, dry, and comfortable, a perineal pad being applied if necessary to absorb drainage. The covers should be neatly replaced and the small sheet and bath blanket folded and put away. All of the equipment should be removed from the bedside to the utility room and cared for in this manner. The irrigation bag and tubing are thoroughly rinsed first with cold and then with hot water; the nozzle is removed from the douche pan with a clamp, rinsed in cold water and then boiled for five minutes; the finger cots are washed with green soap and warm water and boiled for five minutes; and the douche pan is washed thoroughly and sterilized if necessary. All articles should then be returned to their proper places. While carrying out a perineal irrigation the nurse should always observe the condition of the perineum and report at once any signs of infection, such as swelling or redness.

Gynecological patients are allowed out of bed and permitted to walk at different times depending upon the type of operation which has been performed. After a curettage and other minor gynecological operations, they are usually encouraged to get up and often to go home on the day following the operation. However, after a laparotomy or a plastic operation on the perineum, women are kept in bed from ten to fourteen days and then allowed to resume activities very slowly. On the first day up a patient sits in a chair for two half-hour intervals, twice for one hour on the second day and for two hours on the third day. She

takes her first step on the third or fourth day. The entire stay in the hospital of gynecological patients following major operations varies from sixteen to twenty-one days.

When a patient first gets up she needs constant nursing care. She is weak and is apt to have lost her self-confidence. This may discourage her and make her wonder if she will ever feel well again. Then it is that encouragement from the nurse may be so helpful. Patients vary greatly in the rapidity with which they convalesce and therefore no hospital routine should be followed too rigidly. Often on the first day that patients get out of bed they become tired long before the end of the first half-hour and are willing to return to bed after fifteen minutes. One must be careful on the first day the patient gets up not to allow her to overtax her strength.

Usually **vaginal douches** are not given to patients who have any plastic surgery on the vagina and perineum until the fourteenth day, because of the danger of injuring tissues which have so recently been operated on. However, occasionally, because of an irritating discharge, douches are given earlier and then a glass or hard rubber tip should not be used but instead a soft rubber catheter. The way in which a douche is given and its temperature are usually more important than the antiseptics used in the water. Vaginal douches have other purposes than that of bringing antiseptics in contact with the vaginal wall, perineum, and cervix, and of washing away discharge. They give us a method of applying heat when the pelvic structures are inflamed and hence it is that their use is an essential part in the treatment of diseases of the fallopian tubes and ovaries.

Many different kinds of douches have been prescribed, but in most instances the ordinary antiseptic douche powder known sometimes as Pulvis Menthae Composita or briefly as P.M.C. is effective. It contains boric acid, oil of peppermint, carbolic acid, and powdered alum. When a

leucorrheal discharge produces a bad odor a deodorant is indicated and for this purpose potassium permanganate in a strength of from 1-3000 to 1-8000 is prescribed. For special indications, such as infections due to the trichomonas vaginalis, other types of douches, such as the lactic acid, the vinegar, the hypertonic salt, and the bichloride douches are employed.

Many of the steps in giving a vaginal douche are the same as those already described for the perineal irrigation. However, considerable care must be exercised in introducing the douche nozzle into the vagina. Some authorities feel that it is safer to have the patient introduce the nozzle herself rather than to have the nurse do it. However, if the nurse does introduce the nozzle she should remember that the course of the vagina is backward as well as upward.

For the routine douche it is not necessary to have the equipment sterile, but it must be absolutely clean. The nozzle must always be sterilized by boiling for five minutes. However, if the douche is ordered as a treatment following operation on the vagina, cervix, or perineum, aseptic technique must be followed. After the treatment, detach the nozzle and place it either in the douche pan or a special basin provided for it. Leave the patient dry and comfortable when you remove the articles to the utility room. Wash and care for the equipment, boiling the nozzle for five minutes.

No chapter on postoperative treatment is complete without a word concerning the special attention that should be given patients who return from the operating room with drains. Every surgeon of experience knows the danger of foreign bodies being left in the patient. No measure should be neglected which might help prevent this happening. Yet when nurses and doctors do hear of such mistakes or accidents they should not be too hasty

FIG. 44.—A vaginal douche. The patient is on a douche pan. The nurse is shown inserting a glass nozzle into the vagina but in some hospitals it is thought safer to have the patient introduce the nozzle. The course of the vagina is backward as well as upward. Douches are usually not given to patients who have had plastic operations on the vagina and perineum until the fourteenth day but when they are a soft rubber catheter should be used instead of a hard rubber or glass tip and aseptic technique employed. In some hospitals enamel cans are used instead of rubber bags.

in their condemnation of the surgeon who operated on the patient. Surgery has developed to such an extent that while one man still holds the scalpel and rightly is morally and legally responsible for the outcome of the operation there are now in most operating rooms several assistants and nurses cleaned up and helping him in the operation and he must rely to a large extent on them. The old saying that a chain is only as strong as its weakest link is applicable to an operating team. The failure of any member of the team to carry out his or her work skillfully,

carefully, and conscientiously may mean disaster for the patient.

Nothing further will be said here about the measures used in the operating room to prevent foreign bodies being left in wounds. That subject has been covered in the chapter dealing with the operating room. Here, however, we do wish to stress the importance of keeping on the wards exact records of the number and types of drains inserted into the patient in the operating room. It should be the duty of a house officer or nurse to record the date when each drain is removed and by whom. Before the patient leaves the hospital a final examination should be made and on gynecological patients a definite note should be recorded that there are no packs or drains in the vagina.

If in spite of all these precautions a drain or piece of gauze is left in an abdominal incision it usually makes its presence felt by a persistent discharge. Not infrequently the incision will apparently heal and then a few weeks later reopen and drain until the foreign body is removed. If a drain is left in the vagina it produces before long a foul-smelling discharge.

# POSTOPERATIVE COMPLICATIONS

The gynecological patient may develop almost any of the complications that sometimes follow general surgery but there are certain ones to which she seems particularly vulnerable and for which those in charge of her must be constantly on the watch. For instance, the possible development of delayed shock must be borne in mind.

Many gynecological operations are performed with the patient in the Trendelenburg position in which the head is lowered. This helps the blood in the extremities to return to the heart and brain and lessens the chances of cerebral anemia, circulatory collapse, and shock. However, at the termination of the operation the patient's head is raised, her legs straightened out, she is placed on a stretcher and returned to her room. Because of this rather sudden change in position an occasional patient leaves the operating room in apparently good condition but, by the time she has been transported through the hospital corridors, her blood pressure starts to fall. Accordingly, while the fact that the patient leaves the operating room in good condition is encouraging, it should not in any way lessen a nurse's vigilance during the first few hours after the patient returns to her bed. The senior author has observed that patients who have undergone minor operations carried out entirely under avertin

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anesthesia are more likely to have a sudden fall in blood pressure after returning to the ward than are those who have had a more serious and longer operation under ether and avertin. When such a delayed fall in blood pressure is recognized promptly a hypodermic injection of ephedrine will often correct the condition in a short time.

An important cause of delayed shock is **postoperative bleeding.** Fortunately, today one seldom sees postoperative internal hemorrhage, but when it does occur it is usually due to the slipping of ligatures. If the internal bleeding is intraperitoneal, considerable blood may be lost before the condition is recognized. The change in the percussion note over the flanks will disclose the presence of large amounts of blood or any other fluid in the peritoneal cavity, but usually the pulse becomes rapid and weak before this change in the percussion note is detected. If the hemorrhage is severe enough the woman's face becomes pale, the extremities cold and clammy, and the respiratory rate accelerated.

While postoperative internal hemorrhage is today a rare complication, postoperative vaginal bleeding is still occasionally seen following plastic operations on the vagina and perineum. When bleeding occurs after cystocele and rectocele operations or after a cauterization of the cervix, seldom is it profuse or serious; when it is the result of an amputation of the cervix so much blood may be lost in a short time that a patient's life may be seriously jeopardized. Generally, postoperative bleeding appearing eight to fourteen days after a perineal operation is apt to be more serious than that occurring during the first few days of the postoperative convalescence.

A point that must be remembered in discussing postoperative vaginal bleeding is that many pelvic operations temporarily upset the regularity of the menstrual cycle and a woman's period may come on a few days after an operation when she was not expecting it for another two

weeks. This may make it difficult to tell whether or not postoperative hemorrhage is occurring although, as a matter of fact, most women can tell by the way they feel whether or not they are menstruating. However, the surgeon should not rely too much on what the patient thinks about this.

The use of avertin as an anesthetic has markedly decreased the amount of postoperative nausea and vomiting, but it is still expected that a patient will have some nausea during the first twenty-four hours. However, when nausea and vomiting persist over forty-eight hours, the patient's postoperative course can no longer be considered normal and definite measures must be carried out to combat this complication. All fluids by mouth are discontinued and this fluid loss is made up by giving either intravenous injections or subcutaneous infusions. When persistent vomiting is due to acidosis, it can usually be stopped by the intravenous injection of 500 cc. of 10 per cent glucose. In many cases of persistent vomiting a gastric lavage proves helpful, and since this treatment is not infrequently used in caring for a gynecological patient a few of the nurse's responsibilities in giving the treatment will be outlined.

Plain water is usually used for the **gastric lavage.** It is heated to about 102° F. Other solutions used may include sodium bicarbonate 2 per cent or normal saline. The lavage tray is kept stacked as a unit in most institutions and the essential articles include a flat glass bowl containing the various-sized stomach tubes, a medium-sized glass funnel, a large rubber apron and dressing towel for the protection of the patient. The funnel is attached to the stomach tube and both are covered with iced water. The very cold water hardens the rubber, makes its passage into the stomach easier and causes the patient less discomfort. The solution, usually 4000 cc., is warmed and taken to the patient in a large pitcher along with the lavage tray and a pail or

treatment tub. The patient is well protected with the rubber apron and towel. The doctor inserts the tube and holds the funnel low while the nurse slowly pours from 300 cc. to 500 cc. into it. The doctor gradually raises the funnel until the stomach is full, then lowers it and lets the solution drain back into the treatment tub. This procedure is repeated until the solution returns clear, at which time the tube is removed and dropped into the tub. The patient's mouth and face are then cleansed, the draping removed and she is left quiet and comfortable. The articles are removed and put away. The tube should be rinsed in cold water first, then in warm soapy water and then dropped into boiling water for three minutes.

When continuous stomach and upper intestinal drainage seem indicated nasal catheter suction-siphonage is carried out, a procedure which is sometimes spoken of as the Wangensteen method of intestinal drainage. Numerous improvements in technique have been made since Wangensteen and Paine first described this method in 1933, but a fairly satisfactory technique which requires no special apparatus is the following.

A lavage tray with a nasal tube prepared for use, an irrigation pole or standard, and the suction apparatus are taken to the bedside. The suction apparatus consists of two large bottles, a medium-sized drainage bottle, rubber tubing and connecting nozzles. One large bottle is hung high on the irrigation pole, is filled with water and connected by rubber tubing to the other large bottle on the floor. A siphon is started between these two and they are interchanged as the water empties from one into the other. The bottle on the standard is also connected with the drainage bottle and nasal tube by means of rubber tubing and connecting nozzles. The nasal tube is inserted and held in place by adhesive strips. The siphon between the two large bottles creates suction on the other piece of rubber tubing, the drainage bottle and nasal tube, and causes

the gastric contents to drain out into the drainage bottle. The amount, character, color, and odor of the drainage should be noted. As this treatment may run for some time the patient is kept quiet and as comfortable as possible. The patient is allowed to take water and ginger ale while the treatment is being carried on but milk and the fruit juices are apt to clog the tubing and hence are not permitted.

If **intestinal obstruction** is suspected, the surgeon must decide whether or not to operate. When operative interference is deemed necessary he will try to release the obstruction by freeing adhesions and straightening out the intestinal loops, or he may think it wiser to bring one of the loops of distended gut lying above the point of obstruction to the outside, sew it to the skin, open it a few hours later and thus allow the obstructed intestinal contents to drain to the outside. Such an operation is called an enterostomy.

Some patients are worried surprisingly little by an enterostomy and even when such an opening must be permanent they live useful and happy lives. However, enterostomies may cause considerable discomfort and they always remain a source of embarrassment. Dressings must be changed often. Usually this is done by the nurses, but an enterostomy opening should be carefully observed at least once a day by the house officer. The intestinal contents contain enzymes or ferments which, if allowed to flow over the skin, will digest it away, causing ulceration and great discomfort to the patient. Therefore, the edges of an enterostomy opening are covered with either vaseline gauze, lanolin, aluminum paste, or occasionally with yeast. To take care properly of a patient with an enterostomy, to prevent the development of ulceration of the skin, and to keep up the patient's courage demands the highest type of nursing skill and a real sympathy for the sick person. Without these a nurse will find the care of

such a patient difficult and perhaps even a little revolting.

**Abdominal distention** propably worries more gynecological patients than does any other one complication. Even when the distention seems to be only slight it may be sufficient to make the patient uncomfortable and prevent her sleeping. Enemas of various types may be ordered and drugs, such as pituitrin or physostigmin, may be given hypodermically. When the upper abdomen is distended a gastric lavage is helpful. Stupes sometimes give great relief. Usually hot water and turpentine stupes are used alternately, each stupe remaining on the abdomen from fifteen to twenty minutes. If this procedure is going to be helpful it usually relieves the distention in from one to two hours, so there is little use in continuing the use of stupes longer than that. However, if helpful, they may be repeated several times a day.

**Acute dilatation of the stomach** is a complication which fortunately is seen only once in a great while. It is a serious condition which if not corrected promptly may cause the patient's death. The stomach walls suddenly lose all tone and dilate, the pulse becomes weak and rapid and before long the patient goes into a condition of shock. The diagnosis is made by observing the tremendous distention of the upper portion of the abdomen and the change in the patient's general condition. The treatment consists in immediately passing a stomach tube.

Another rare complication which may be mentioned in connection with the gastrointestinal tract is parotitis or surgical mumps. The parotid glands which lie in the sides of the neck below the jaws become infected and swollen and the patient presents the same picture as does a child with ordinary mumps. The condition is usually the result of bacteria being carried from the mouth along the parotid ducts to the glands. The postoperative instance of this complication can be lessened by proper care of the patient's mouth. A mild antiseptic mouth wash should be or-

dered for all patients and they should be encouraged to use chewing gum. When parotitis does develop it is first treated conservatively by the applications of icecaps to the inflamed glands, but if suppuration sets in the infected glands must be incised.

Many postoperative respiratory complications may be prevented. It is the duty of the house officer to carefully examine each patient before operation and this, of course, includes an examination of the throat and chest. The presence of tonsillitis, coryza, or bronchitis contraindicate all except emergency surgery. However, it sometimes happens that the physician's general physical examination done on the day before operation is entirely negative and during the night the patient contracts a cold. If a nurse discovers this she should at once report it before the patient goes to the operating room.

It is very important that patients be kept warm following operations. Body temperatures are apt to fall during an anesthetic and if a patient becomes chilled after returning to the ward respiratory infections may follow. Some of the pulmonary postoperative infections seem definitely to follow chilling but probably more of them result from hypostatic congestion of the lungs caused by the patient remaining in one position for a long period of time. Hence, it is important that the nurse change the patient's position often and that she encourage her to turn herself from side to side every little while.

One complication which gynecological patients are especially likely to develop is **phlebitis of the pelvic and femoral veins.** There are three factors which play large parts in producing this condition: trauma, infection, and stasis of the venous blood system. Hence, gynecological patients should not have their lower extremities massaged because, if the veins are traumatized, phlebitis may result. Changing the patient's position helps, as it aids the venous return flow and lessens stasis. Once femoral

phlebitis has developed it is treated by keeping the affected leg at complete rest. Icecaps are applied but they should not be allowed to remain on over two hours at a time as their constant application may cause a frostbite. The patient is sometimes made more comfortable if the leg is wrapped in cotton.

Phlebitis is a serious complication. It usually prolongs the hospital stay four to five weeks and, what is even more important, emboli or clots of blood sometimes break off in the infected veins and are carried to other parts of the body, particularly the lungs. Pulmonary embolism is feared by the gynecologist probably more than any other complication for, if the emboli are large, they are usually fatal. They are apt to occur between the twelfth and twentieth days after an operation, not infrequently just at the time when the patient is about to leave the hospital apparently entirely recovered from her operation. Sometimes, as has been said, pulmonary emboli occur in patients known to have a femoral phlebitis but not infrequently they are seen in women who, up to that time, have seemed free of any postoperative complication. In these latter instances there is probably an unsuspected phlebitis of the pelvic veins. Some patients do recover from pulmonary emboli but in these cases the emboli are usually small.

There are few things in medicine more terrible to watch than the sufferings and sudden death of a patient with a large **pulmonary embolism.** A patient will be seized suddenly with a severe pain in the chest, gasp for breath, look terribly frightened, and sometimes before she has time to summon aid may fall over dead. More often the course of events is not so rapid and the patient may cough up some blood-tinged sputum and the pulse will become weak and rapid. Whether or not a patient with a moderate-sized pulmonary embolus recovers depends upon her general condition, her heart action, and the location and

size of the particular pulmonary veins which the embolus occludes.

As soon as it is recognized that a patient has a pulmonary embolus she is given cardiac and respiratory stimulants, but the most important part of the treatment is complete rest. She needs all her strength to fight the condition and no added strain should be put on the cardiac muscle. Moreover, a patient who has had a pulmonary embolus is in great danger of having another and the likelihood of this occurring may be increased by moving her.

One complication which may follow any type of surgery that necessitates giving the patient a general anesthetic is **back strain.** It is due usually to carelessness either in placing the patient on the operating table, in lifting her from the table to the stretcher, or in transferring her from the stretcher to her bed. It is almost always due to something that could have been avoided and still, even today in the best hospitals, it is a rather common postoperative complaint which may add greatly to the patient's discomfort. Great care should be taken in handling the unconscious patient. In the senior author's memory of an appendectomy performed on him twenty-five years ago postoperative backache still remains as the outstanding unpleasant recollection of his entire stay in the hospital.

Another complication of a more serious nature that occasionally results from improper position on the operating table is **nerve paralysis.** It is the nerves of the forearms that are most often injured and such injuries are especially apt to occur when a patient is placed on her side for a kidney operation. The weight of the patient should not be allowed to rest on the arms in such a way as to cause pressure on the nerves. The responsibility for placing the patient in the proper position while in the operating room is shared by the surgeon and the trained anesthetist, but when the woman is returned to her bed this responsibility is taken over by the nursing staff. Bed-

sores may result from pressure necrosis. They are especially apt to develop in emaciated patients and in women who are very obese. The sacrum and heels are the most frequent sites of bedsores. Whenever possible a patient's position should be changed as soon as the nurse sees a reddened skin area. Those patients who are incontinent are particularly apt to develop bedsores, and a nurse's efficiency can be judged by the way she handles such patients.

Rupture of the abdominal incision is a complication which is rarely seen but when it does happen needs immediate attention. It occurs especially in obese patients whose postoperative course is complicated by prolonged abdominal distention, persistent vomiting, or coughing. Occasionally it occurs as a result of improper suturing of the layers of the abdominal wall and perhaps it is sometimes due to poor catgut. Rupture of the abdominal incision may occur at any time during the patient's convalescence, but usually it is within the first two weeks. The intestines come out of the peritoneal cavity and may be found lying over the skin. As soon as the condition is recognized the patient must be sent back to the operating room for a secondary closure.

In addition to the special conditions which have been mentioned, the convalescence of the gynecological patient may be complicated by any of the diseases which all of us may develop at any time. However, if that time happens to be after an operation, a medical condition which ordinarily would cause little concern may become of great importance. The senior author has seen chicken pox and measles develop between the seventh and fourteenth postoperative days and recently has had under his care a patient with what threatened to be an unusually alarming combination of medical and surgical conditions. A woman on whom he had operated for a ruptured ectopic pregnancy developed whooping cough with the typical parox-

ysms of coughing and vomiting on her fourth day after operation. Fortunately in her case the pertussis vaccine quickly controlled the paroxysms of coughing and the patient made a complete recovery from both her surgical and medical conditions.

# FEMALE UROLOGY

Many of the patients who consult a woman specialist complain of urinary symptoms. Sometimes a pelvic examination shows that a tumor of the uterus or ovaries is pressing on the bladder and interfering with its proper function; then again, it may be a cystocele or prolapse of the uterus that is responsible for the woman's discomfort. However, in many instances the urinary symptoms are due to an infection or some other pathological condition in the urinary tract itself.

It is difficult in some cases for the physician to decide whether the primary trouble is in the generative or the urinary tracts. If he does not properly evaluate the patient's symptoms and the conditions found on examination, he may subject a woman to a long series of unnecessary bladder treatments, while what she really needs is the operative correction of a cystocele; vice versa, the surgeon may perform an unnecessary operation for retroposition of the uterus on a patient whose symptoms are due to chronic pyelitis.

Fewer such mistakes will be made if the specialist is a competent female urologist as well as a gynecologist. In the same way, the nursing problems and postoperative complications arising in the gynecological patient so often concern the urinary tract, a short section on female urol-

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Labels on figure:
Kidney substance
Cranial calyx
Renal pelvis
Abdominal Ureter
against psoas
Iliac vessels
Pelvic ur.
Vag. portion of ureter
Wall of bladder
Bladder
Urethra
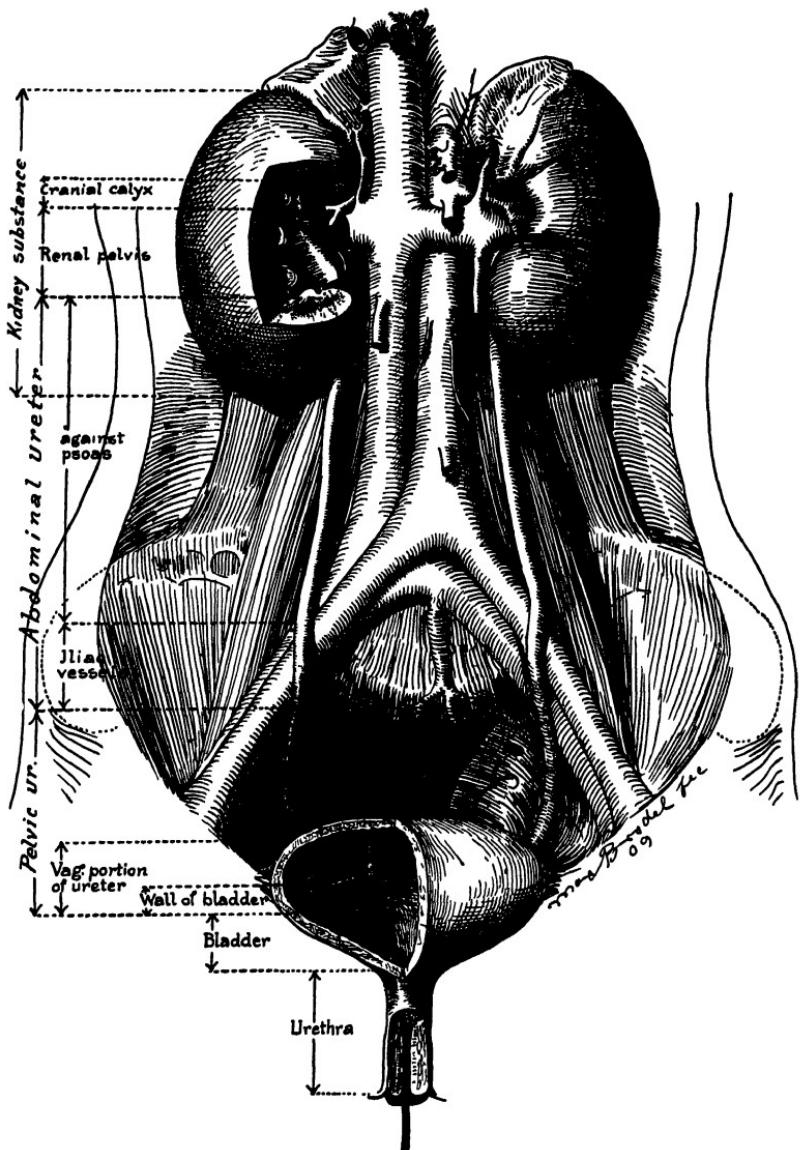
Fig. 45.—The urinary tract in a woman. A catheter has been passed into the right kidney and on the right side the various divisions of the urinary tract are labeled. Windows have been cut out of the bladder, the urethra, and the right kidney pelvis so that the course of the catheter may be more clearly seen. The ureters pass over the large vessels at what is sometimes called the pelvic brim. The adrenal glands overlap the upper poles of the kidneys. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder.* D. Appleton Company.)

ogy seems indicated in any book on gynecological nursing. Even from an anatomical point of view the urinary and genital tracts are in such close proximity that it seems logical to consider them together.

As has been brought out in another chapter, the urethra and especially the Skene's or periurethral glands are among the first structures that the gonococcus invades and sometimes the organisms remain in these areas after they have disappeared elsewhere. However, it must be emphasized that many other bacteria besides the gonococcus can cause urethritis. In fact, only a small proportion of the women the female urologist sees with urethritis have gonorrhea. The colon bacillus, the staphylococcus, and the streptococcus are responsible for the majority of these infections.

**The chief symptoms of both urethritis and cystitis are dysuria, or pain on urination, and frequency of voiding.** Pollakiuria is the correct term for frequency of urination but this symptom is often spoken of under the name of polyuria which, according to medical dictionaries, is defined as the excessive discharge of urine. Sometimes when there is marked pain on voiding the patient will pass a few drops of blood at the end of urination. This is spoken of as terminal hematuria and is of no special significance. On the other hand, **painless hematuria,** that is the passage of blood in the urine without the patient experiencing any pain on voiding, is a symptom which strongly suggests malignancy of either the bladder or kidneys.

Urethritis in women is usually easier to clear up than it is in men because the urethral canal in the female is only about 3.5 cm. (1½ in.) in length. Most infections of the urethra remain limited to the mucous membrane of the canal, but occasionally the inflammation will spread to the tissues outside of the urethra and a suburethral abcess develop which will require incision and drainage.

A tumor which is seen fairly often in women is the

**urethral caruncle.** It is a vascular growth which arises from the external urinary orifice. Usually it is quite small and fortunately it is benign. Nevertheless, in spite of its size it may cause the patient great discomfort, producing dysuria or pain on voiding and dyspareunia or painful sexual relations. Sometimes these little tumors are very sensitive to touch and the mere pressure of the clothing on them may cause great pain. When urethral caruncles are removed by the scalpel or knife they have a tendency to recur within a few months even though they are not malignant. Better results are obtained when they are burnt off by electricity or fulgurated.

In women **cancer of the urethra** is such a rare condition that it hardly needs more than to be mentioned. It occurs almost exclusively in elderly women. The diagnosis should be made only after a biopsy specimen from the growth has been submitted to careful microscopic study. The senior author stresses this point perhaps more than is necessary· but he has seen recently a patient who was badly burned with radium which was given in a small hospital for a supposed cancer of the urethra. Biopsy studies of the growth later proved that it had never been malignant. When cancer of the urethra has been proved to be present, radium is the best method of treatment but it should be used with great care. Surgical excision of the growth is seldom attempted as it is difficult to remove all of the cancer and the operation is apt to leave the patient permanently incontinent.

The *bladder* is a hollow viscus with muscular walls in which the urine secreted by the kidneys collects until the woman has an inclination to void. This usually occurs when the bladder contains from three to four hundred cc. However, the bladder is capable of great distention and it is not so unusual to catheterize patients and obtain over a liter of urine. Such distention of the bladder is, however, harmful and should not be allowed to occur. Not in-

*frequently after operation repeated catheterizations are necessary and if the patient is unable to void, she should be catheterized at intervals of from eight to twelve hours depending on how uncomfortable she is and also on what operation was performed.*

**Cystitis** occurs in women more often than does urethritis and is more resistant to treatment. Not infrequently the inflammation in the bladder is secondary to an infection in the kidneys, but sometimes an infection starts and remains localized in the bladder. When cystitis is tuberculous it is almost always secondary to a tuberculous lesion in the kidney for the tubercle bacillus rarely if ever causes a primary infection of the bladder.

One type of lesion which it is difficult both to diagnose and to cure is the elusive bladder ulcer or, as it is sometimes called, the Hunner ulcer. On cystoscopic examination it can, as is suggested by its name, be easily overlooked even though it usually presents a characteristic picture.

In the treatment of infections of the urinary tract the urologist wants to know what organism is responsible for the condition because, after he has obtained this information, he usually is able to treat the patient more effectively. Hence it is that urine cultures are so often taken. The organisms which most often infect the bladder and kidneys are the colon bacillus, the streptococcus, and the staphylococcus. There are others, however, that not infrequently involve these structures.

In the treatment of cystitis the remedies prescribed vary not only according to what organism is grown from the urine but also according to whether the urine is acid or alkaline. The treatment consists, however, not only of prescribing medicines by mouth but also of giving urethral and bladder instillations and irrigations. These treatments are usually carried out by the nurse. Two per cent boric acid is the solution most often prescribed for

bladder irrigations and from 500 to 1000 cc. is the quantity used for one treatment. Irrigations are often followed by instillations of one ounce of silver nitrate in strengths of 1 to 500, or 1 to 1000. Bladder irrigations and instillations are given as a rule once every two days but sometimes they are given oftener. If the condition does not clear up promptly a cystoscopic investigation is indicated, but usually this examination is not carried out while a bladder infection is in the acute stage. When the bladder is inspected through a cystoscope, one may see in a case of subacute or chronic cystitis a generalized reddening of the entire bladder mucosa, or a localized injection over the trigone in which latter case the patient is said to have a trigonitis. Not infrequently small bladder ulcers will be seen. These may be treated by touching them through a cystoscope with small cotton pledgets soaked in 5 to 10 per cent silver nitrate. When the ulcers heal slowly or are of a type known as the elusive or Hunner ulcer, pure silver nitrate may be used on them, the silver nitrate being fused on the end of a long stick which can be made to pass through a Kelly cystoscope. In the most resistant cases either the local application of pure carbolic acid is tried or electrical fulguration.

**Stones are formed much less frequently in the female than in the male bladder.** This is probably due to the lesser incidence of urethral obstruction which, when present, causes stagnation of the urine in the bladder. Another reason for this is that any calculus that arises in the kidneys and travels down through the ureters to the bladder is usually able to pass out through the short female urethra. However, one occasionally sees large stones in the bladder which cannot pass through the urethra. These must either be crushed in situ with a special crushing instrument and removed piecemeal through a cystoscope, or the bladder opened. In such instances the bladder may

be either approached suprapubically or entered from below through the vagina.

Some of the large calculi that have been removed from the bladder have originated through the deposition of calcium salts on foreign bodies. Sometimes material outside of the bladder such as the hair and teeth found in dermoid cysts and the concretions in appendix abscesses will burrow into the bladder and lodging there set up stone formation. Instances have been reported of surgical sponges, left accidentally in the peritoneal cavity, later ulcerating into the bladder. However, the great majority of foreign bodies found in the bladder have been accidentally introduced by the patient into the urethra. Sometimes this happens when a woman is attempting to bring on an abortion. Many different types of foreign bodies have been found in the bladder, the list including such objects as lead pencils, splinters of wood, and wire hairpins.

**New growths of the bladder** develop four times as often in males as in females and yet we see these neoplasms in women not infrequently. A few of the bladder tumors are secondary to growths elsewhere, such as carcinoma of the cervix, but most of them are primary. The majority are carcinomata or papillomata. Other tumors are rarely seen in the bladder. When the biopsy study shows the typical microscopic picture of malignancy there is of course no doubt about the diagnosis. However, it is difficult to prognosticate in bladder papillomata. A piece of the tumor may be removed and when it is examined in the laboratory a diagnosis of benign papilloma may be obtained and still the growth may continue to grow, metastasize, and kill the patient. This is due to the fact that sometimes the cystoscopist will remove tissue merely from the superficial part of the growth, which microscopically is benign, while if sections had been taken from the base of the tumor they would have shown malignancy. Therefore, one has to take into account not only the microscopic picture of the biopsy

specimen but also the way the tumor appears when inspected through a cystoscope, before drawing any definite conclusions as to how an individual growth is going to respond to treatment. If the tumor is attached by a pedicle the prognosis is better than when the tumor infiltrates the bladder wall. Bleeding is usually the first symptom of bladder tumors, although occasionally polyuria may be. If the tumor becomes infected dysuria, or painful urination, is added to the other symptoms. In malignancy cachexia is seen in the late stages.

Most authorities are agreed that small benign papillomata should be treated by fulguration through the cystoscope but there is still considerable disagreement as to which is the best method of treating malignant tumors and in different clinics the same types of growths may be treated differently. Some urologists still recommend a partial or complete removal of the bladder, but others feel that equally good if not better results are obtained by the use of radium. In some instances the bladder is opened through a suprapubic incision and the radium is inserted into the growth, while in other cases the radium is used through a cystoscope. No matter what method of treatment is carried out or whether the tumor is microscopically malignant or benign, every patient who has had a vesical growth should be followed carefully for a long time and cystoscopic examinations carried out at regular intervals.

The ureters are the tubes which connect the kidneys with the bladder. They lie beneath the peritoneum and are approximately 27 cm. (10½ in.) long. The diameter of the ureter is not uniform. At certain points corresponding to changes in the direction or relations of the canal, constrictions occur above which the ureter exhibits fusiform dilations or spindles.

Carcinoma of the ureter is fortunately a very rare condition. Occasionally stones passing down from the kid-
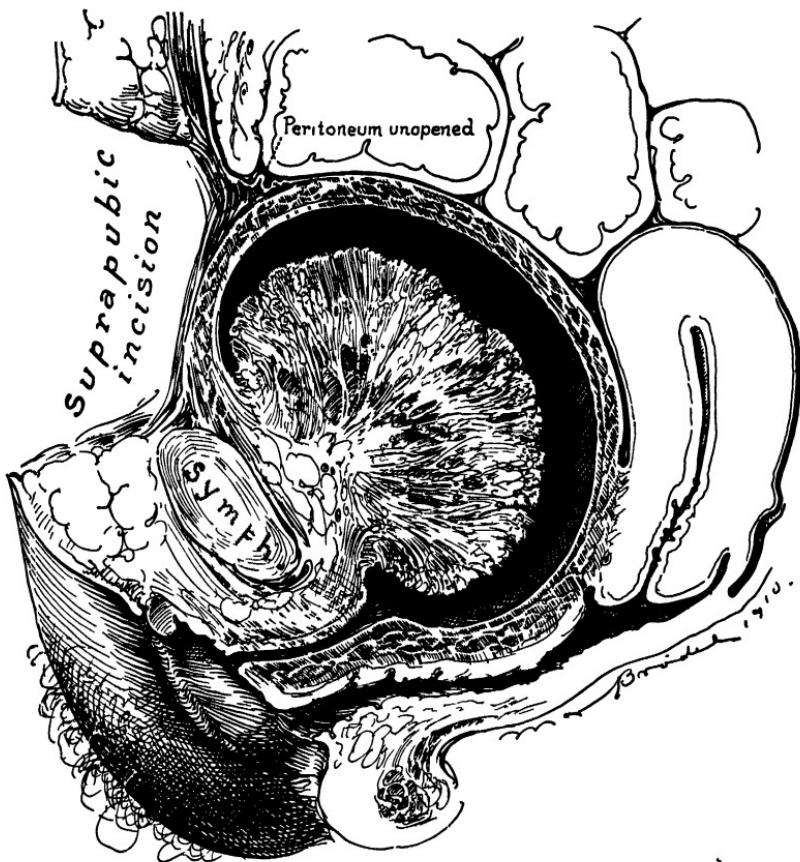
FIG. 46.—A cancer of the bladder seen in sagittal section. This particular tumor arose in the part of the bladder which lies behind the symphysis pubis. Malignant tumors of the bladder usually first show their presence through the symptom of *painless hematuria*. The cancer was removed by a suprapubic incision. The suprapubic incision is shown in the drawing. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder*. D. Appleton Company.)

ney become stuck in the ureter and cause symptoms, but unquestionably stricture is the commonest pathological condition found in the ureters. Guy Hunner, who has written extensively on ureteral stricture and has accomplished so much good by directing the attention of the medical profession towards this condition, considers that ureteral
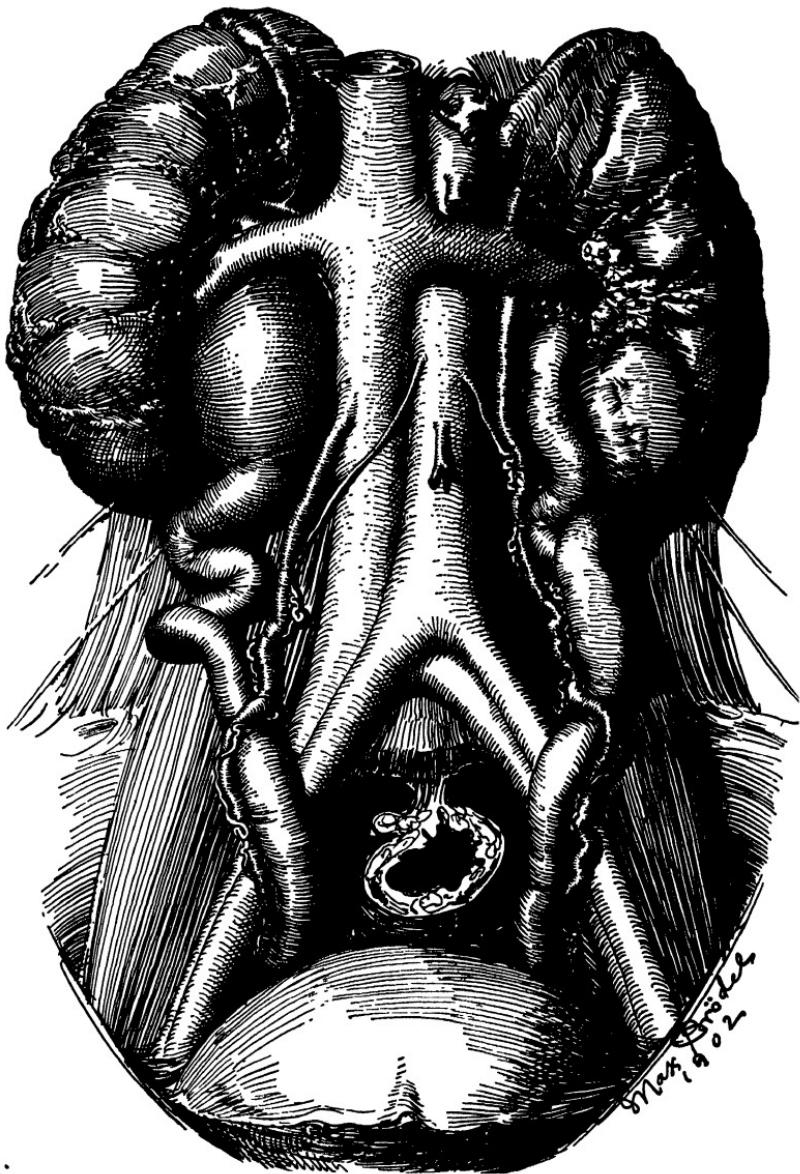
FIG. 47. —This drawing is from a patient who had bilateral ureteral strictures. Due to back pressure both ureters became markedly dilated, a condition known as bilateral hydroureter. The pelvis of the right kidney also became dilated, in other words showed a hydronephrosis. Fortunately only a small percentage of patients with ureteral stricture develop as much pathology as is shown in this picture. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder.* D. Appleon Company.)

stricture is one of the commonest causes of backache, pains in the flank and abdomen, and urinary symptoms. In short, he believes that ureteral stricture is responsible for a large percentage of the complaints which cause women to consult urologists and gynecologists. There are, however, some authorities who, while agreeing with Hunner that ureteral stricture is a definite clinical entity which should be thought of often, do not feel that the condition is quite so wide spread. Ureteral stricture produces a dilatation of the ureteral lumen and kidney pelvis with a resulting loss in renal function.

The diagnosis is made on the history and cystoscopic examination. In a typical case the urologist will encounter in the ureter an obstruction to the passage of a renal catheter, and the X-rays will show a definite narrowing in the area of the stricture, with a dilatation of the ureter above it. Hunner stresses that the passage of a catheter up a ureter does not exclude the presence of a stricture. He places a bulb made of pure beeswax a few cm. from the tip of the catheter, and if on withdrawing the catheter there is a hang of this bulb at a definite area, he feels that this establishes the diagnosis of ureteral stricture even though practically all other examinations are negative.

The **treatment of ureteral stricture** consists of dilating the ureter with catheters on which bulbs of increasing size are placed. The average number of ureteral treatments which is recommended is four, given at intervals of from ten days to two weeks, but often a larger number of treatments is necessary before the stricture has been sufficiently dilated to relieve the patient's symptoms. When there is bilateral ureteral stricture one side may be treated one week and the other side the following week.

**Kidneys**—Bright's disease is a term which has been used to include both the acute and chronic forms of nonsuppurative nephritis. Probably more people suffer from

Bright's disease than from any other renal condition. In acute nephritis the patient has headache, elevation of temperature, and swelling of the face and extremities. The blood pressure is usually elevated and the urine shows albumin, casts, and red blood cells. When the disease is chronic the symptoms and signs may not be so marked unless the disease is in its terminal stages. Then the urinary output decreases and the patient is apt to pass into uremic coma and finally die.

The care of patients with the ordinary type of nephritis belongs to the practising physician in internist and is covered in detail in books on general medicine rather than in those devoted to gynecology and female urology. It is well, however, to emphasize that nephritis may occur along with other renal lesions and should be first considered when the urine contains albumin and casts, when the kidney function as shown by various renal tests is impaired, and when the blood pressure is markedly elevated.

On the other hand the treatment of the pyogenic or pus-forming infections of the kidney pelvis, or what is known as pyelitis, forms a large part of the practice of the female urologist and gynecologist. Pyelitis is seen at all ages but especially in young children and in pregnant women.

**With the onset of acute pyelitis** the patient is apt to have a chill and suddenly develop a marked elevation of temperature which may rise to 105° F. There is often backache and, if the pyelitis is bilateral, which is frequently the case, the patient may complain of pain in both lumbar regions. Dysuria and polyuria are usually present but sometimes the bladder symptoms are not marked and, because of this, an infection of the urinary tract may not be thought of when a physician is endeavoring to explain a marked elevation of temperature. The urine usually contains large quantities of pus cells but sometimes they do not appear in the urine until several days after the on-

set of the disease. This may be due, when the disease is unilateral, to the infected kidney being temporarily blocked off. The urine culture is positive early in the disease and is, therefore, of great value.

All patients who have acute pyelitis should be kept in bed at complete rest. Up until a few years ago it was the custom to force fluids and alkalinize the urine with such alkalies as sodium bicarbonate or "citrocarbonate" and even today this is recognized as a method of treatment which often produces satisfactory results. However, recent advances in urinary antiseptics have brought about marked changes in our methods of handling patients with pyelitis. Instead of fluids being forced they are often restricted to 2000 or 1500 cc. in twenty-four hours, so that the concentration of the prescribed antiseptic may be greater.

Moreover, if one of the mandelic acid preparations is to be used, the urine is not alkalinized but is acidified, as mandelic acid is effective only when the urine is very acid, that is, when the pH (or hydrogen-ion concentration) drops below 5.5. The urine is brought to this degree of acidity by giving the patient enteric-coated ammonium chloride in doses of 60 gr. per day and by prescribing an acid-ash diet. It usually takes about forty-eight hours for the urine to reach the desired acidity. In a hospital where one has the help of a skilled dietitian, an acid-ash diet can be worked out which allows considerable choice and variation in the articles eaten but, for the ambulatory patient, the following instructions suffice. The patient is allowed to eat meats, fish, cereals, cranberries, prunes, and plums. She is not allowed to take milk, leafy vegetables, such as spinach and cabbage, or any fruit juices or fruits except those mentioned above.

While mandelic acid treatment is being continued the urine should be tested daily, so that one may be certain that the proper acidity is being maintained; otherwise

one can expect no results from this drug. The senior author prefers the ammonium mandelate pills to the elixirs and syrups of mandelic acid, as they are less nauseating.

Mandelic acid therapy is most effective when the colon bacillus is the infecting organism and, as these bacteria are responsible for about 80 per cent of all urinary infections, one can understand how useful this drug is. If this method of treatment is going to be successful it usually accomplishes its result in three weeks. It is the senior author's opinion that unless the patient is markedly improved by that time there is very little use in continuing the drug. There may be, of course, complicating factors such as stones in the kidneys or strictures in the ureters which might keep up the infection. A cystoscopic study should not be too long delayed if the patient is not responding satisfactorily to drug therapy.

In certain urinary infections and particularly those due to the streptococcus, **sulfanilamide** and **sulfathiazole** have been found to be curative. The method of using these drugs in the urinary infections is exactly the same as that employed when they are used in the treatment of gonorrhea, which has been described elsewhere. However, we want again to emphasize that sulfanilamide and sulfathiazole are powerful drugs which usually produce unpleasant symptoms and which, unless the patient is carefully followed, may be the cause of serious and even fatal complications. We repeat, complete blood and urine studies should be made at least every other day. Never should these drugs be taken by a patient without her physician's knowledge and never should a nurse recommend that a patient take them. Personally, we feel very strongly that it should not be possible for a patient to obtain sulfanilamide or sulfathiazole from a druggist without a prescription from a physician.

Sulfanilamide is sometimes effective in urinary infections when mandelic acid therapy fails, especially, as has

been said, if the infecting organism is the streptococcus the converse is also true that mandelic acid sometimes succeeds when sulfanilamide fails. These two drugs are not antagonistic to each other but complementary.

The senior author prefers in all urinary infections, except those due to the streptococcus, to prescribe mandelic acid before using sulfanilamide. It is certainly safer, does not upset the patient as much as either sulfanilamide or sulfathiazole and is effective in just as high a percentage of cases. It is in the streptococcus infections, whether in the urinary tract or in other parts of the body, that sulfanilamide is particularly successful.

Many other antiseptics were used before mandelic acid and sulfanilamide became available but clinical experience and laboratory studies have shown that many of these had very little bactericidal value. Among these older antiseptics hexamethylenamine, known as urotropin, was one of the most useful. Others that in some cases were definitely helpful were hexylresorcinol (capricol), mercurochrome, acriflavine, and pyridium.

The results of mandelic acid compounds and sulfanilamide are so much better than those formerly obtained by the use of other antiseptics that the number of patients with uncomplicated pyelitis who have to be cystoscoped, has markedly decreased. However, lavage of the kidneys with sterile normal salt solution or silver nitrate in a strength of 1-1000 is still advised in persistent cases of pyelitis and also in any cases in which complications are suspected. The usual procedure is to pass a catheter, lavage the kidney and remove the catheter but sometimes the catheter is left in the kidney for several days and occasionally for a week during which time the kidney is lavaged at least once every twenty-four hours.

The possibility of a urinary infection being due to tuberculosis must always be remembered. Tuberculosis of the kidney is secondary to tuberculosis elsewhere in the

body. Not only must the lesion in the urinary tract be taken care of but it is equally important that the woman should receive the general supportive measures, such as prolonged rest and forced nourishment, that are usually given a patient with active tuberculosis. In many instances a lesion in the lungs can be demonstrated, but sometimes the lungs are clear both on physical examination and X-ray study. In these cases the primary pulmonary lesion probably is or was in the bronchial or retroperitoneal lymph glands or in the intestines.

**Tuberculosis of the urinary tract** is not an uncommon condition and it is seen quite frequently in both sexes. The first lesion in the urinary tract is practically always in the kidney. The ureter on the same side and the bladder may be secondarily involved. Fortunately, the disease does not usually involve the second kidney for quite a long period of time and because of this an early nephrectomy in many instances cures the condition. The prognosis is, of course, markedly influenced by the amount of pulmonary involvement that is present.

The onset of renal tuberculosis is often insidious. Pain may be present. Polyuria, dysuria, and hematuria are apt to be the first symptoms, due usually to a secondary involvement of the bladder in the tuberculous process. Loss of weight and night sweats may be a feature. Sometimes there is little in the history to make one suspect that a urinary infection is tuberculous. When a general physical examination reveals tuberculosis elsewhere in the body in a woman complaining of urinary symptoms, the possibility of renal tuberculosis should at once be suspected. In many instances, however, tuberculosis is not considered until a cystoscopic examination is carried out.

In a typical case the bladder on cystoscopic examination presents a characteristic picture. A pyelogram may be of help in arriving at the diagnosis. However, one can be sure of the diagnosis only when tubercle bacilli are found

coming in the urine from the affected kidney or are grown on culture. Often many specimens must be examined before these organisms can be demonstrated. In suspicious cases it is well to inject a catheterized specimen of urine into a guinea pig. In this way a positive diagnosis can sometimes be made when all other diagnostic measures fail. However, it, is necessary to wait from three to six weeks to obtain results from the guinea pig inoculation.

There is only one treatment for tuberculosis of the kidney, namely, nephrectomy, and the sooner the affected kidney is removed the better it is for the patient. After operation, as has already been said, the patient should receive general supportive treatment. The duration of the postoperative treatment and general care will of course depend usually on the findings in the lungs.

If there is no extensive pulmonary tuberculosis the prognosis in unilateral renal tuberculosis is surprisingly good. In a follow-up study of cases treated on the gynecological service at the Johns Hopkins Hospital and reported by the senior author in 1922, complete recovery followed nephrectomy in approximately 60 per cent of the cases and an additional 20 per cent were improved by the operation. It is rather interesting that this follow-up study showed that a large number of women were alive and well as long as twenty years after the removal of the tuberculous kidney.

One complication that often prolongs the convalescence after a nephrectomy for tuberculosis of the kidney is a draining sinus which may worry the patient for many months and occasionally even years. The patient will need to be dressed often during this time and unless constantly reassured may feel that the wound will never heal, and become discouraged.

**Kidney stones** are not uncommon in women although the incidence is greater in men. The symptoms that they cause very according to their size and also according to

whether or not they are causing partial or complete oc-
clusion of the kidney pelvis or ureter. Often infection de-
velops around a stone so that even if the patient is having
no symptoms, and X-ray studies show that there is no
dilatation of the kidney pelvis, there is some danger in
leaving a calculus indefinitely in the urinary tract. If a
stone descends into the ureter and becomes lodged there
it may cause a dilatation of the ureter above it and also
of the kidney pelvis. The latter condition is known as
hydronephrosis.

Stones vary not only in size and shape but also in their
chemical composition. A few are made of a single sub-
stance but most of them contain several different com-
pounds. The principal chemical constituents are uric acid,
sodium and ammonium urates, calcium oxalate, and mag-
nesium phosphate. Other types of stones that are rarely
seen are those made up of cystine, xanthine, and calcium
carbonate. Occasionally one sees a stone that is made up
entirely of bacteria, albumin, fibrin, and blood. Such
stones are usually soft in consistency in contrast to other
calculi which are very hard.

There is now some evidence that certain types of stones
are especially apt to develop when a patient is on an acid-
ash diet and that others form when the diet is such as to
make the urine alkaline. At present few urologists believe
that by prescribing a special diet for a patient with kid-
ney stones the latter can be made to dissolve, but many
authorities feel that a proper diet, after surgical removal
of stones, lessens the chances of recurrence. The indicated
type of diet depends of course upon the chemical nature
of the stone or stones that were removed from the patient.

There is probably no more severe pain to which human
beings are subjected than that of renal colic. However,
many patients with kidney stones never have renal colic
and the calculi are only accidentally discovered when
X-rays are taken in the course of a thorough medical
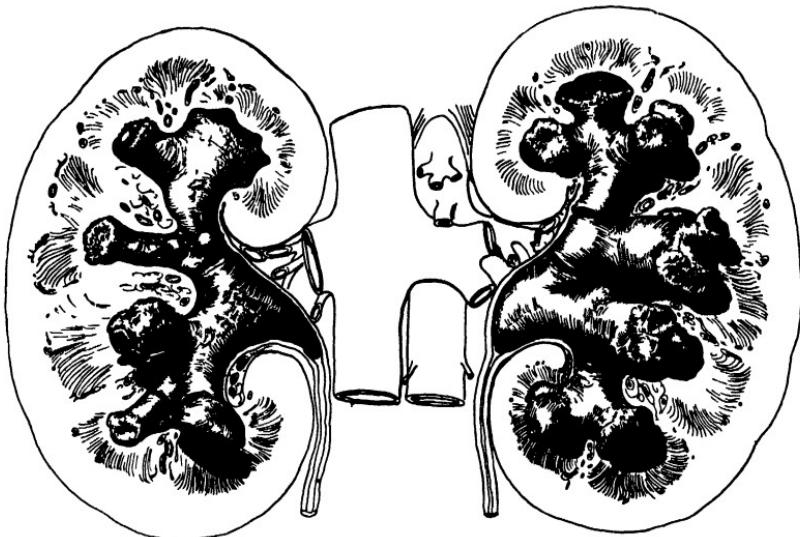
FIG. 48.—The pelves and calyces of both kidneys are filled with stones. It takes considerable judgment to decide correctly just how best to treat patients with stones in both kidneys. The urologist takes into consideration the results of all the functional urological studies in deciding whether or not to operate and which side to operate on first if surgery is decided upon. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder*. D Appleton Company.)

study. Nevertheless, even a so-called silent stone is apt to cause renal damage and, as has been said, it is not uncommon for infection to set in around the stone. Every patient with a kidney stone should have a thorough cystoscopic examination before the decision to operate is finally made. It is important that the urologist know the functional capacity of both kidneys and whether or not any infection is present. The kidney containing the stone may have the better function of the two. When there are stones in both kidneys, considerable surgical judgment may be required in deciding which kidney to operate on first.

Most of the large kidney stones can be removed only by operation but some of the smaller ones and many of those

that are found in the ureter can be made to pass by cystoscopic treatments. When one kidney is found to be filled with stones and its function largely or completely destroyed, it is often better to do a nephrectomy rather than to attempt to remove all the stones and leave a badly infected and much damaged kidney. However, such problems as to whether or not to operate and what operation to perform must be decided in each instance on the basis of the patient's general condition, her age, and the cystoscopic and laboratory findings.

**Kidney tumors**—A great majority of new growths in the kidney are malignant. They occur principally in two forms, the embryomata or Wilms' tumor and the hypernephromata. The former are very malignant. They are seen especially in young children and occasionally in infants of only a few months. Sometimes by surgery, radium, and X-ray the lives of these unfortunate children may be prolonged for a short time but so far as cure is concerned the condition is practically hopeless. Hypernephromata are seen in adult life; they too are malignant but not as much so as embryomata. Occasionally an early case is saved or at least the patient's life is prolonged for quite a number of years.

Renal neoplasms when advanced cause pain in the flank and loss of weight, but the cases that are recognized early and operated on when there is a chance for cure usually have just one complaint, namely, painless hematuria. This is a symptom that should never be neglected. As soon as it occurs a thorough cystoscopic examination should be carried out with the taking of bilateral pyelograms, and if the pyelograms indicate the presence of a tumor, operation should not be delayed. However, it is not uncommon at operation to find that the tumor has invaded the surrounding tissue to such an extent that its removal is impossible. Recently, in cases of large kidney tumors, deep X-ray has been used and in some instances a tumor that

had been considered inoperable has decreased so much in size that its removal has become possible.

The following is a short description of some of the operations that are carried out on the urinary tract and the indications for performing them.

A *nephrectomy* is the removal of the kidney and one speaks of a right or left nephrectomy, depending upon which kidney is removed. The operation is indicated in unilateral tuberculosis, in cancer of the kidney, and in certain cases of nephrolithiasis. Moreover, when the function of one kidney has been destroyed by infection and the *function of the other* one is normal or almost normal a nephrectomy is often advised. In some instances of renal tuberculosis or malignancy, part or all of the ureter is removed with the kidney and this operation is called a *nephroureterectomy*.

Kidney stones are usually removed by either an operation called a *nephrotomy* or by a *pyelotomy*. In the former, an incision is made through the functioning kidney substance, while in a pyelotomy only the pelvis of the kidney is opened. The latter procedure cannot be used in all cases of nephrolithiasis but, when it can be, it is the procedure of choice because by it no kidney substance is injured. While nephrotomies and pyelotomies are indicated most often in cases of kidney stone they are also employed for other urological conditions.

Sometimes stones, in traveling downward from the kidney to the bladder, become stuck in the ureter, and, when by cystoscopic treatments it is impossible to budge these stones, it becomes necessary to open the ureter. Such an operation is known as a *ureterotomy*.

A *nephropexy* means a suspension of a kidney. In marked instances of nephroptosis, or dropped kidney, a nephropexy is sometimes advised. This operation was in the past carried out in many cases in which we now know it was not indicated and of course these patients were not

benefited. Because of these failures the operation fell for a time into disrepute and was almost abandoned. At present, it is the general belief that in selected cases a nephropexy brings great relief to the patient. In all cases in which he is considering suspending the kidney, the senior author takes retrograde pyelograms with the patient standing and lying down, to determine just how much the kidney drops when the patient is on her feet. In a group of very carefully selected cases he has had satisfactory results from the operation.

A *decapsulation of the kidney* means the stripping of the capsule from the kidney. This procedure has been tried in some cases of advanced chronic nephritis with marked renal impairment, and also in bichloride poisoning, but most urologists have been disappointed with the results from this operation.

A *cystotomy* means the opening of the bladder. The operation is usually carried out from above and it is then spoken of as a suprapubic cystotomy. Occasionally the bladder is opened from below through the vagina. Stones may be removed in this way but there is always the danger of such an opening failing to close or, in other words, of the patient developing a vesicovaginal fistula.

A *partial cystectomy* is sometimes carried out for cancer of the bladder but radium and X-ray are more often used for this condition. A few operators have in a small number of cases removed the entire bladder and implanted the ureters into the large intestine. Such an operation is a very major procedure and of course carries with it considerable mortality.

It is well for a nurse to know the essentials of urological pathology and something about the operations performed on the urinary tract, but it is more important that she understand the various tests that are employed in making a urological diagnosis, for a large part of the actual carrying out of many of these tests is left in her hands.

Although a study of a twenty-four hour specimen of urine gives the physician more information than does that of a single specimen, nevertheless the examination of a single specimen enables the physician to tell whether or not albumin, sugar, pus, or blood are present. Considerable care is needed to obtain a specimen of urine which is free from contamination. In the male, washing the external urethral orifice is all that is necessary, but in the female it is difficult and sometimes impossible to obtain a specimen of urine which does not contain a few pus cells that have been carried into the specimen from the external genitalia or from a discharge originating in the cervix. Occasionally, by discarding the first part of the specimen, this difficulty can be overcome and this procedure can be carried out when specimens are collected from either sex. A report of negative findings can be depended on, but the presence of a few pus cells in a voided specimen can never be considered as definite evidence of urinary infection in a woman. These findings must be confirmed by the examination of a catheterized specimen.

There are several different techniques that have been employed in **catheterizing female patients.** For many years what might be called the wet and dry pledget technique was used in many hospitals. The nurse prepared two sterile bowls, one containing dry sterile pledgets, the other sterile pledgets soaked in boric acid. After separating the labia minora with gloved fingers, or at least with sterile rubber finger-cots, the nurse, using a sterile instrument, wiped off the external urinary meatus with three wet pledgets and then with one dry one. After repeating this process three times, thus using nine wet and three dry pledgets, the sterile catheter was inserted into the bladder.

Relatively few infections followed this method but it was cumbersome and difficult for a nurse to carry out on a patient in bed, especially if she had had a perineal op-

FIG. 49.—Catheterizing a patient in bed. A glass catheter is being used. The external urethra has been twice painted with 5% mercurochrome. Two round enamel bowls are at hand to collect the urine in. When a sterile specimen is desired the urine may be allowed to flow directly into a sterile test tube or on to some bacteriological medium, such as blood agar. On the large stand at the foot of the bed can be seen a bottle of 5% mercurochrome, sterile tooth pick swabs and sterile cotton pledgets. The catheter was taken from an oblong container. The sterile forceps used in picking the sterile tooth pick swabs out of a sterile jar appears in the picture.

eration. Therefore, simpler methods were devised. The senior author, in his office, paints the external urethra with one pledget soaked in 20 per cent mercurochrome, but on the wards of the Johns Hopkins Hospital only 5 per cent mercurochrome is used. In the cystoscopic clinic, the urethra is simply washed off with one pint of bichloride of mercury in a strength of one to one thousand. In many hospitals it is still customary for the nurses to scrub their hands before catheterizing a patient and to put on either

gloves or finger-cots but as long as only the sterile cathe-
ter touches the external urethra this is hardly necessary.

In our opinion, it does not matter so much what anti-
septic is used in cleaning the urethra as it does that the
person doing the catheterization knows the anatomy of the
external genitalia. The following is not written as a crit-
icism but as a record of facts. The senior author has on
several occasions been told by graduate nurses and once
by a hospital floor superintendent that they had cathe-
terized a patient and had obtained no urine and he has
found that the catheter has been passed not into the
urethra but into the vagina. Such a mistake can easily
be made by a nurse who has had little gynecological train-
ing, especially on patients who have had plastic opera-
tions on the vagina.

In catheterizing a patient, a nurse must neither pass the
catheter too low and thus enter the vagina nor direct it
too high and strike the clitoris, which is an unusually
sensitive little structure. It is customary to moisten the
catheter with some lubricant, such as sterile white oil, as
this makes it pass more easily and lessens the patient's
discomfort. Some nurses prefer to use soft rubber cathe-
ters but there is certainly a minimum of danger associated
with the use of glass catheters. The one time that the use
of glass catheters is definitely contraindicated is in the
last three months of pregnancy.

The senior author, in his office, usually follows every
bladder catheterization with an instillation of one ounce
of silver nitrate in a strength of one to one thousand. This
antiseptic supplement to an aseptic technique may not be
necessary, but as it is his custom to get a sterile specimen
and often a culture from every new patient who has any
urinary complaints, it adds an extra safeguard against in-
fection. In eighteen years of practice he does not know
of a single infection that has followed a catheterization
done in his office.

FIG. 50.—A bladder instillation. A funnel with rubber and glass connec-
tions is being adjusted to a glass catheter which has already been passed into
the bladder. All the apparatus has been sterilized in the instrument container
shown on the bed. Care is taken that no air enters the system for if air is
injected into the bladder it causes the patient discomfort.

In obtaining a specimen of urine either for culture or
for search for tubercle bacilli, a strict aseptic technique
must be followed. The first few cc. of urine coming
through the catheter must not be used. Six drops of urine
are sufficient for a culture if the urine is allowed to run
from the catheter directly into a tube containing bacteri-
ological media. If the urine is to be poured over cultural
media, not at the time of catheterization, but when it
reaches the laboratory, a larger specimen is collected, usu-
ally about five cc.

In taking a culture it is customary after the sterile cot-
ton is removed from the culture tube to flame the end of

Fig. 51.—A bladder irrigation. The patient is on a douche pan. A two-way catheter is to be inserted. The fluid runs from one tube into the bladder and out of the bladder through another tube. When a two-way catheter is not at hand the ordinary catheter may be used. The fluid is then poured into the funnel until the patient complains of discomfort. The funnel is then lowered and the fluid returns from the bladder. This procedure is repeated several times.

the tube, then to flame the end of the catheter and finally, when the urine has run into the tube, again to flame the end of the tube before the sterile cotton is reinserted. When specimens are collected for the purpose of injecting them into guinea pigs, in order to determine whether or not tubercle bacilli are present, about 20 cc. of sterile urine are needed.

**Bladder irrigations,** as has already been said, are sometimes used in cases of cystitis. The technique while simple is of course carried out aseptically. An ordinary catheter may be used and when the bladder is emptied a sterile

glass funnel is connected with the catheter by means of rubber tubing. The solution to be used for the irrigation is then poured into the funnel until the patient complains that the bladder is full. The funnel is then lowered below the level of the external urethra and the fluid returns. This procedure is repeated several times. Great care must be exercised to see that the irrigating system be allowed at no time to become completely empty for, if this does occur, air may be sucked back into and distend the bladder, causing the patient discomfort. Irrigations are usually given at a temperature of 38.8°C. (105°F.).

If a more prolonged irrigation is desired a two-way catheter may be used and left in place as long as it is necessary (Fig. 51). The fluid then runs in through one side of the catheter, washes the bladder and returns through the other side. When two-way catheters are left in place for several hours they should be inspected every little while, for not infrequently these catheters become clogged and then the bladder becomes over distended.

**Tests of renal function** yield information of great value. An impairment of excretory power of the kidneys, as shown by these tests, may be the first indication that any disease is present. Moreover, they enable a urologist to judge how much surgery a patient can stand. For instance, if a woman has one kidney that is filled with stones and heavily infected, but on the other side a normally functioning kidney with no stones, a nephrectomy may be the operation of choice. On the other hand if the supposedly good kidney turns out to have impaired function it may be better judgment to simply remove the stones and leave that kidney in place, even though it has very little function. In making such decisions the function of both kidneys is always taken into consideration.

The simplest of the kidney function tests consists in collecting all the urine specimens for twenty-four hours and recording the amount and the specific gravity of each

voiding. The specimens are divided into day and night urine. When such a test is carried out the patient is kept on a special diet and the total fluid intake is recorded. Under such conditions the ability of a normal kidney to concentrate urine is known and also in what way the night urine varies from that passed during the day. Definite variations from the known normal values indicate impaired renal function.

The phenolsulphonephthalein test, commonly spoken of as the **"phthalein test,"** is the one most often used and in fact might be said to be the standard test for renal function, that is, of the excretory power of the kidneys. Originally, the dye was injected intramuscularly but today it is usually given intravenously. One cc. of 0.6 per cent of phenolsulphonephthalein (phthalein) is used. The functional capacity of the kidneys is determined by the length of time it takes for the dye to appear in the urine after it has been injected, and by the quantity eliminated in definite periods of time. A catheter is often inserted into the bladder at the same time that the dye is injected and is left there during the test. The urine then flows directly into a receptacle which contains some alkaline solution, such as sodium hydroxide or sodium bicarbonate.

We prefer using the latter to sodium hydroxide for a reason which may seem foolish to some or at least rather like guarding against an accident that never could occur. Nevertheless, a fatal accident once did occur because of sodium hydroxide being in a cystoscopic room. In what hospital it happened or to what doctor does not concern us, except to take this opportunity to express our admiration for that physician who, instead of saying nothing about this tragedy, had the courage to report the incident in one of the leading medical journals in order that others might profit from his experience and avoid making the same terrible mistake.

What actually happened was this. In doing a cysto-scopic examination this doctor had passed catheters into both kidneys and had collected specimens into bottles containing a concentrated solution of sodium hydroxide, as had been the routine for most urologists up to that time. He had then intended to fill the kidney pelves with a solution of sodium iodide or sodium bromide, either of which are used for taking pyelograms, but by mistake he either was given or he reached for the bottle of sodium hydroxide, which grossly has the same appearance as sodium bromide or iodide. However, sodium hydroxide is a very strong caustic and his patient died in a very short time. Since then we have not had sodium hydroxide in the cystoscopic room but have used exclusively sodium bicarbonate, which would not injure the kidneys if by mistake it were to be injected into them. Such caution may be unnecessary but certainly the recording of this true account of a fatal accident can do no harm and may emphasize to nurses and doctors how easy it is for such mistakes to occur.

It is necessary to add an alkali to the excreted urine for the red color of the excreted phthalein comes out in an alkaline solution. A record is kept of the time that the dye is injected, and when it appears from the bladder, as is shown by the urine becoming pink or red in color. This is usually between three and five minutes after the phthalein is given intravenously. The urine is then collected at a definite period of time after this color is first noticed. The study of a thirty-minute specimen is usually satisfactory but one does obtain a little more information by collecting four fifteen-minute specimens. The amount of dye eliminated in these specimens is estimated by colorimetric methods based on the intensity of color in the specimens. The normal output is 40 per cent for the first fifteen minutes, 17 per cent for the second, 8 per cent for the third, and 4 per cent for the fourth. An output of phthalein be-

low these figures indicates that renal damage has occurred.

Sometimes instead of introducing a catheter into the bladder and thus collecting the specimen directly, the patient is told to void at regular intervals. This is a fairly satisfactory method but not as accurate as when there is a catheter in the bladder, for the appearance time necessarily cannot be determined. Whenever indicated, differential tests are done, which means that specimens from each kidney are collected through renal catheters which have been introduced through a cystoscope.

Another dye which formerly was injected intravenously and used as a test for renal function is indigo carmine This, however, is definitely inferior to phthalein. The dye when excreted from the kidneys gives the urine a blue color, which is more difficult to estimate quantitatively than is the red color produced by phenolsulphonephthalein.

When the kidneys are definitely impaired the extent of the renal damage can be estimated by determining the amount of urinary excretory products retained in the blood. Blood specimens for such estimations are taken in the morning. The patient is allowed to have nothing by mouth after midnight until the specimen of blood is taken. Such tests show the amount of nitrogen retained in the blood. In some clinics urea is the nitrogenous product which is measured. The amount normally present is from 10 to 15 mgm. per 100 cc. of blood. In other clinics the nonprotein nitrogen which normally is present in the blood in amounts from 25 to 35 mgm. per 100 cc. is measured. Any increase in either urea or nonprotein nitrogen above these figures is an indication of definite renal damage.

## CYSTOSCOPY

The examination of the urine and the various tests of renal function yield valuable information, as has been said, but the only way that many urological diagnoses can be made is by cystoscopy. By this it is not meant that every patient who has any urinary symptoms should at once be cystoscoped. On the contrary, the author feels that this examination should only be carried out when there are very definite indications and that certain conditions, as for instance an acute cystitis, at least temporarily contraindicate cystoscopy. However, when a patient is suspected of having a benign or malignant bladder tumor, a new growth of the kidney, or renal tuberculosis, a cystoscopic examination should not be delayed. Then too, when a plain X-ray film shows a shadow which looks as though it were due to a stone in the kidney or ureter, this question can best be settled by cystoscoping the patient and passing opaque catheters into one or both kidneys. It will then be evident whether the shadows seen are in or or outside of the urinary tract. It has already been pointed out that cystoscopy is contraindicated in acute urinary infections, but when such infections become subacute or chronic a thorough cystoscopic study with the taking of specimens and cultures from both kidneys is advisable.

There are two methods of cystoscopy. The first is the indirect or water method which is carried out with the patient lying on her back. The bladder is distended with water. The cystoscopes used in this method are equipped with magnifying lenses and these instruments are very expensive. They should not be sterilized by boiling but by soaking them for thirty minutes in some antiseptic solution such as mercury oxycyanide in a strength of 1 to 3000. In water cystoscopy a large bottle of sterile water, with the rubber tubing necessary to connect with the cystoscope, must be ready.
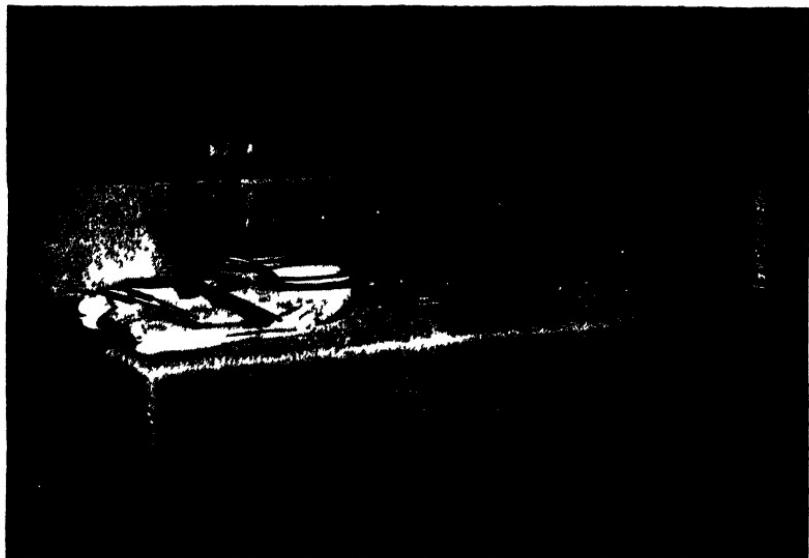
Fig. 52.—Cystoscopic table set-up with the usual sterile equipment neces
sary for the air or Kelly method of cystoscopy. The clamps in the container
on the right are used by the nurse to hand the operator the different instru
ments. These instruments include cystoscopes, ranging in size from a #5 to
a #11, two-way syringes, urethral dilators, metal ureteral searchers, glass
catheters and funnels with rubber tubing to be attached to the catheters
when bladder instillations are given. On the left side of the picture,
spread across two sterile towels, are a group of ureteral bougies and two
ureteral catheters. On each ureteral catheter is a small rubber shield by which
the physician can grasp the catheter without contaminating it.

In male urology the water method of cystoscopy is al-
most always the one used and it is preferred by some urol-
ogists for examination of the female. Certainly it requires
less practice and training for a physician to become pro-
ficient in its use than it does in the use of the second
method in which the bladder is distended with air. This is
due largely to the fact that in the air or Kelly cystoscope
there are no lenses and hence no magnification of the field
of vision. Nevertheless, it is felt by those working in the
Women's Clinic of the Johns Hopkins Hospital that the
direct or Kelly method of cystoscopy is more satisfactory

for the diagnosis and treatment of urological conditions in women.

The senior author prefers that his patients be given 100 mgm. (1½ gr.) nembutal by mouth and 20 mgm. (1/3 gr.) of pantapon hypodermically one-half hour before coming to the cystoscopic room, but others of the staff use a hypodermic injection of Schlessinger's solution. In large clinics the patient is usually prepared in a room outside of the cystoscopic room. This is done in order to save time. An ordinary hospital stretcher with a device for locking the wheels makes a satisfactory table on which to carry out this examination.

Just before a patient is taken into the cystoscopic room, she is catheterized, and after the urine is withdrawn, one pipette full of a sterile nupercaine solution (1–500) is injected into the urethra and a small cotton pledget soaked in the same solution is applied to the external urethra.

It is essential that a nurse understands the **knee-chest position** for it is very important that she get the patient properly placed. The patient's feet should come to the edge of the table, the knees should be separated slightly, and the thighs should be at right angles to the table. The patient rests on her chest, not on her elbows, while her arms hang over the sides of the table. A small pillow under the chest sometimes makes the patient more comfortable but it is often easier to get an obese patient in proper position if no pillow is used.

The patient is draped with a special sheet which has an opening in the center large enough for the doctor to work through. Above the patient's back a light is placed and, incidentally, cystoscopic rooms should be equipped with a light that hangs from the ceiling and which can be moved in all three directions. A light that is on a stand resting on the floor can be used, but it is not as satisfactory as a light that is suspended from the ceiling. In the Kelly method the cystoscopist uses a head mirror to re-

FIG. 53.—The knee-chest position. This is used in the Kelly or air method of cystoscopy. The chest rests on the table, the elbows are spread far apart so that the patient rests on her chest and not on her elbows. The face is turned to one side. The thighs should be at an angle of 65° to the body, as is shown in this picture. This position is also used when it is necessary to inspect or treat the vagina of a little child. A small Kelly cystoscope can be introduced into the vagina without injuring the hymen. The senior author has employed this position in several instances in removing foreign bodies from the vagina. When this position is used the patient is of course draped with a cystoscopic sheet which covers her completely except for the small area through which the urologist works. (Kelly, Howard A. *Medical Gynecology*. D. Appleton Company.)

flect the light on to the patient. In carrying out this type of cystoscopy it is not essential that the cystoscopist clean up as though he were going to perform an operation for he never touches with his hands the cystoscopic field.

**Kelly cystoscopes** are made of metal and can be sterilized in the same way as ordinary surgical instruments. The instruments used in Kelly cystoscopy include Hegar dilators to stretch the urethra, Kelly cystoscopes of different sizes, usually ranging from six to eleven, alligator forceps which are used to make local applications through
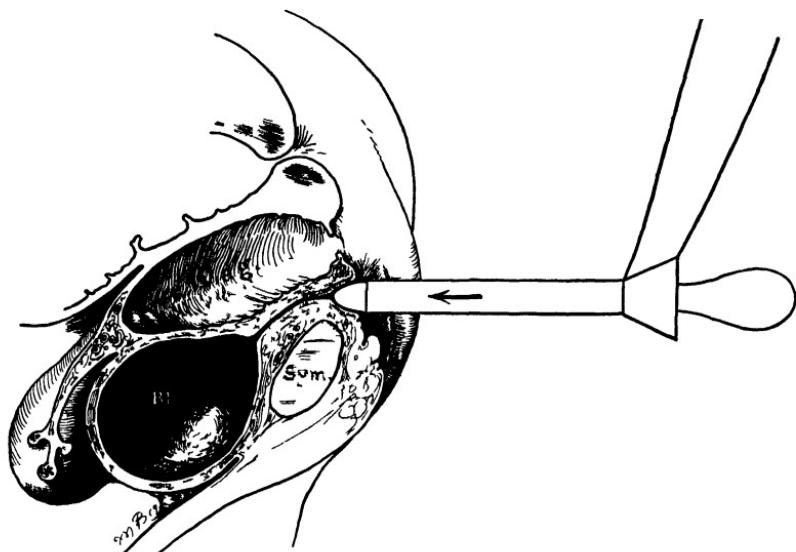
FIG. 54.—A Kelly cystoscope is being introduced into the urethra. The patient is in the knee-chest position. The relationship of the urethra, bladder, vagina, and rectum is shown. Kelly cystoscopes are simple, inexpensive, and easily sterilized, while water cystoscopes are more complicated, much more expensive, and cannot be sterilized by boiling. (Kelly and Burnam. *Diseases of the Kidneys, Ureters and Bladder.* D. Appleton Company.)

the cystoscope, an aspirator, and a metal searcher; also a two-way syringe, medicine glasses, catheters, and funnels with rubber tubing to connect them with the catheters should be at hand. Small cotton pledgets which have been dry sterilized should be available. These are used to soak up the various antiseptics that are applied through the cystoscope to the bladder and urethra.

The **kidney catheters** are not sterilized with the other instruments but are previously prepared by soaking them thirty minutes in a solution of bichloride of mercury (1–1000) and then holding them in boiling water for one minute. The catheters used in air cystoscopy are stiffened by wire stilets. The catheters and stilets having been sterilized separately, a nurse, scrubbed just as though ready for an operation and in sterile gown and rubber

gloves, inserts the stilets into the catheters, puts small, sterile, rubber shields on the ends of the catheters, and then places the catheters in sterile glass tubes which will keep the catheters straight. The open ends of the glass tubes are then plugged with sterile cotton and a label is placed on each tube showing the type of catheter, its size, and the date on which it was sterilized.

Kidney catheters are of two types. The first is the so-called plain renal catheter which is used for collecting specimens and lavaging the kidneys. The second type of catheter is permeated with bismuth so that it casts a shadow by X-ray and can be easily visualized in films. This type can be used for all purposes that the first one is used for and should always be used when X-ray films are taken. The average length of the renal catheters used in female cystoscopy is 50 cm. The stilets are just a few centimeters longer than the catheters.

When it is desirable to know the separate function of each of the kidneys a differential phthalein test is carried out. Renal catheters may be passed into both kidneys, 1 cc. of phthalein given intravenously, the appearance time from the two sides recorded, and the output of phthalein from each kidney measured for either fifteen or thirty minutes. If it seems better not to pass catheters into both kidneys at one time, only one kidney may be catheterized and a glass catheter inserted into the bladder. The examiner then considers whatever phthalein comes out through the bladder catheter as representing the output of the kidney that was not catheterized. This second method is fairly accurate but is not as reliable as when both kidneys are catheterized. It is usually the duty of a nurse to keep a record of the time that the phthalein is injected, when it appears from each side, and to collect the specimens at the proper time.

In urology many of the diagnoses are made by X-ray. Plain X-rays give information about the size and position
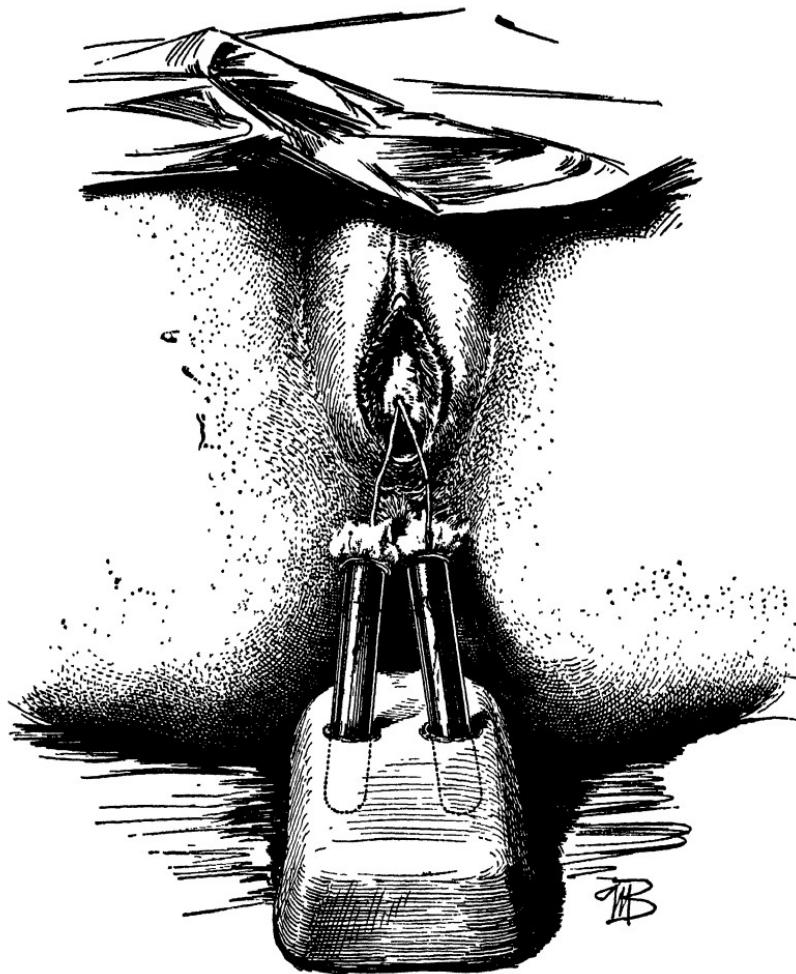
FIG. 55.—Both kidneys have been catheterized with renal catheters. Sterile specimens are being collected from both kidneys. The urologist may also take cultures for bacteriological studies from both kidneys, carry out a differential phthalein test and take pyelograms of one or both sides. Pyelograms are taken by injecting into the renal catheters some substance, such as sodium iodide, which will show in the X-ray films. When the kidney pelvis is filled with the solution the patient will complain of discomfort in the sides and back. (Kelly, Howard A. *Operative Gynecology*. D. Appleton Company.)
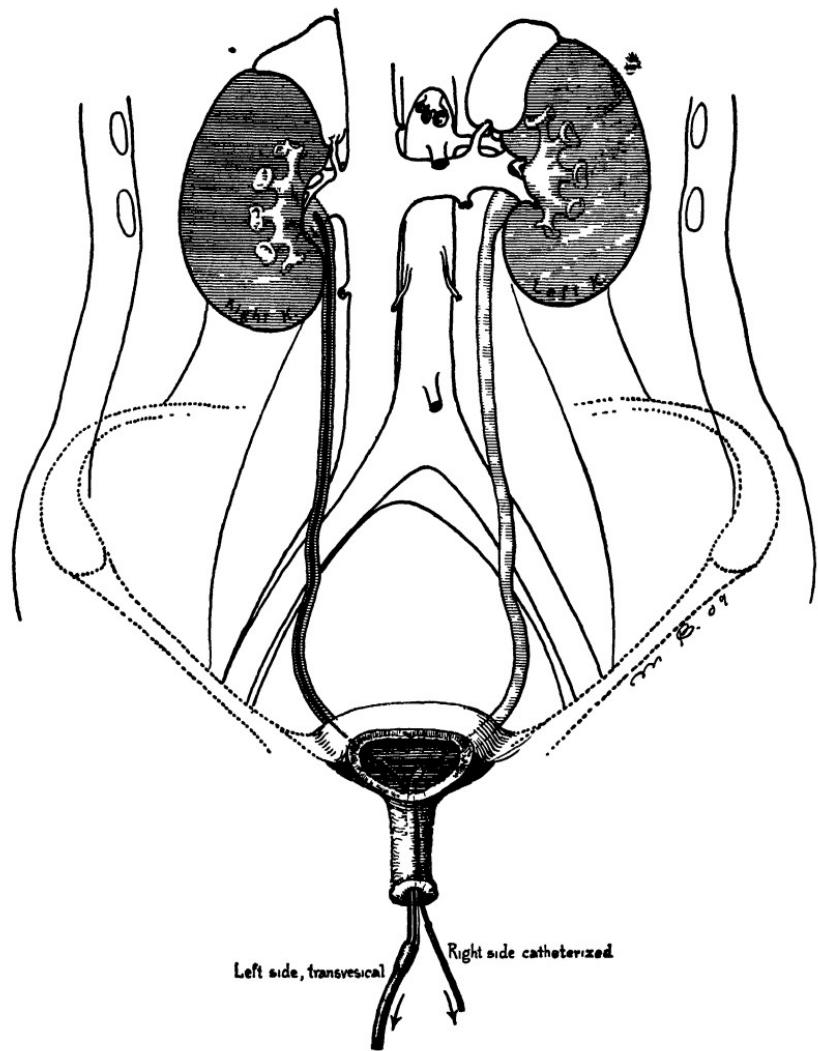
FIG. 56.—This shows how a differential phthalein test can be carried out
when only one ureter is catheterized. A catheter has been passed into the
right kidney. The urine coming from the left side passes through the bladder
and comes out of the bladder catheter. For a differential phthalein test to
be carried out in this manner to be reliable a sufficiently large renal catheter
must be used on the right side to block the ureter and prevent any urine
flowing around the ureteral catheter into the bladder. (Kelly and Burnam.
*Diseases of the Kidneys, Ureters and Bladder.* D. Appleton Company.)

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of the kidneys and are helpful in diagnosing renal calculi. When, however, a patient is suspected of having a kidney tumor, such as a hypernephroma, or when it is desirable to know the size of the kidney pelves, **pyelograms** are more helpful than plain X-rays. Pyelograms are taken by injecting through renal catheters radio-opaque solutions by means of which the kidneys and ureters can be visualized.

Quite a number of different solutions have been used for this purpose. At first heavy metals such as sodium iodide and sodium bromide were used, but more recently solutions which are less irritating to the kidney have to a large extent replaced these heavy metals.

The normal picture of the kidney pelvis and the ureter, when they are filled, with these solutions is well known, and it is now recognized that certain pathological conditions, such as tuberculosis of the kidney and kidney tumors, produce characteristic changes in the pyelograms which may help the urologist to make the diagnosis.

The actual technique in the taking of a pyelogram consists of injecting through a kidney catheter one of these solutions until the patient complains of a sensation of fullness in the kidney region, which means that the kidney pelvis has been completely filled. Usually a glass burette is filled with the solution and connected with the open end of the renal catheter. The burette is then held so that the solution in it is about eighteen inches above the level of the patient. This causes the solution to run in slowly and is apt to cause the patient less discomfort than if the solution is injected with a syringe. The normal amount of fluid that a kidney pelvis should hold is known, and, by measuring the amount of fluid that can be injected before a patient complains of pain, we can determine whether or not the kidney pelvis is enlarged or, in other words, whether there is a hydronephrosis.

If, as in young children and in some adults, it is unde-

sirable and very difficult to catheterize the ureters, the urologist may inject into a vein of the forearm a solution which, when excreted by the kidney, will show in an X-ray film. By this method, which is known as **intravenous pyelography,** the urinary tract can often be fairly well outlined, although the pictures are inferior to those obtained by retrograde pyelography in which opaque solutions are injected through renal catheters directly into the kidney pelves.
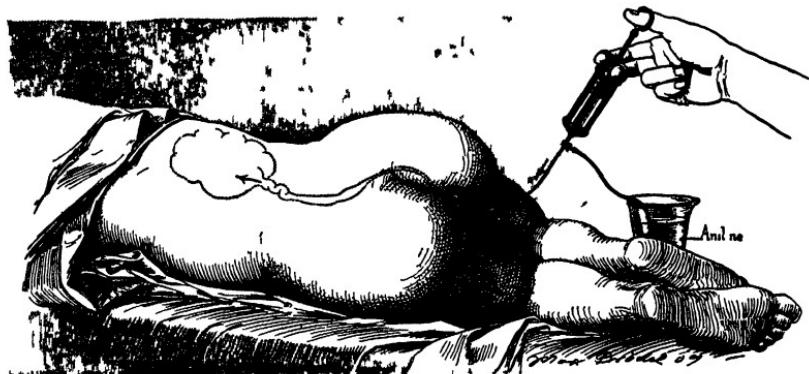
Cystoscopy is used not only as a diagnostic measure but also as a means of treatment  In cases of bladder ulcers strong antiseptics can be applied through a cystoscope to a localized area in the bladder. Bladder tumors can be removed transurethrally by electricity and radium applied to a cancer through a cystoscope. In renal infections the pelves of the kidneys can be irrigated through ureteral catheters. Dilatations of a ureter may relieve the

symptoms of ureteral stricture. Kidney and ureteral
stones can sometimes be made to pass by cystoscopic
treatments and thus the patient may be saved an opera-
tion. Usually renal catheters are left in place only a few
minutes but sometimes, in severe infections, they are left
in place for hours and even days, and during this time the
kidneys may be lavaged at regular intervals by injecting
antiseptic solutions through the catheters.

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